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DATABASES
File on six packages

LIGHTPENS
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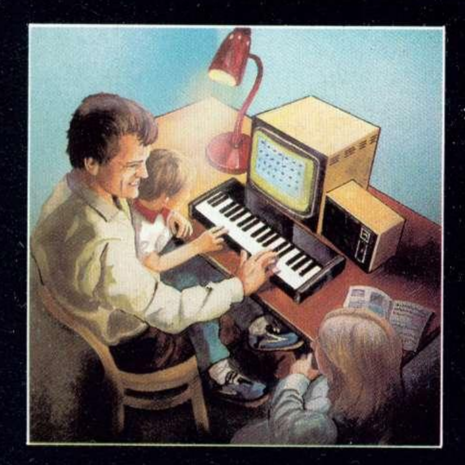
BARCODES

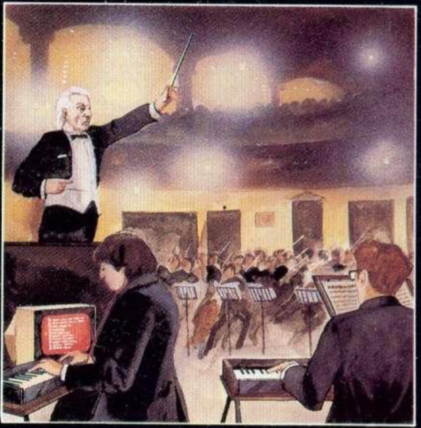
Program entry at a stroke

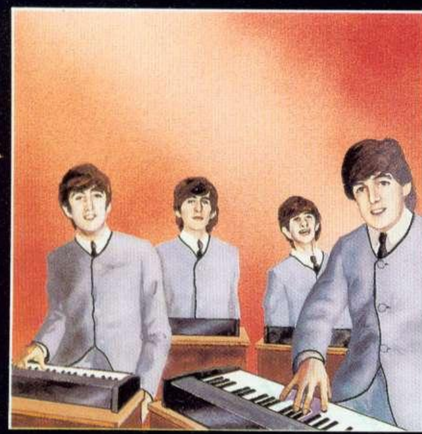
252 PAGE XMAS XTRA

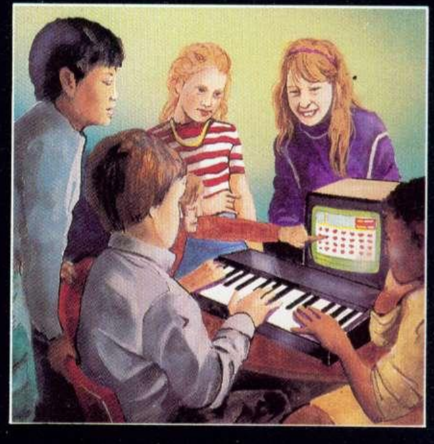
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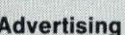
BARCODES
Program entry at a stroke

December 1984 **No 29**

Cover photograph by Simon Edwards

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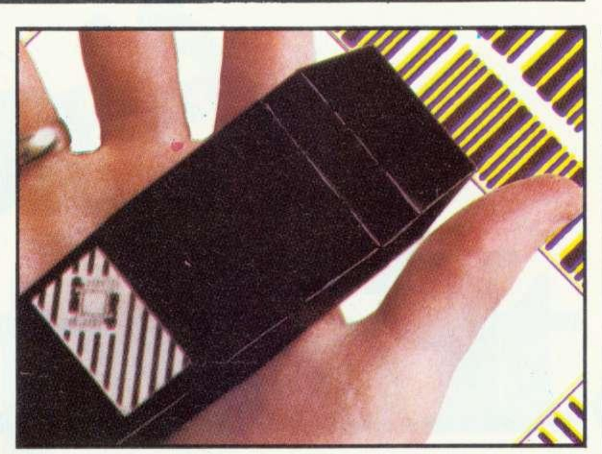
Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text, with diagrams on separate sheets. Please enclose programs on disc or cassette, with a listing if possible. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything. Please include a suitable stamped, addressed envelope for return. Articles are acknowledged on receipt.

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THE ONE AND ONLY BBC, ELECTRON AND ATOM MAGAZINE

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NEXT MONTH . . . GAME SPECIAL

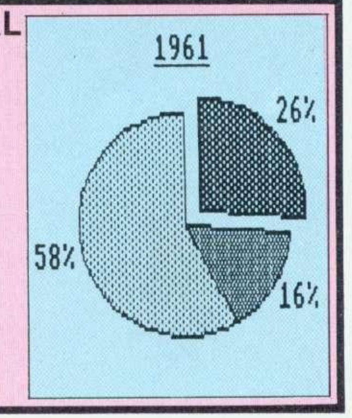
Quadline
A superb game written in Basic and assembler for the BBC micro and Electron

Picture Slide
Reconstruct the 3D perspective picture by moving blocks of the screen. Mode 2 graphics written on the Electron

Interrupt-driven tunes
How to imitate the music on games

Advanced graphics
Speedy colour fills to use in programs, with examples in business pie-charts and bar charts

Wordprocessor choice
Our reviewer helps you decide which to choose



Is this new F
another
First read th



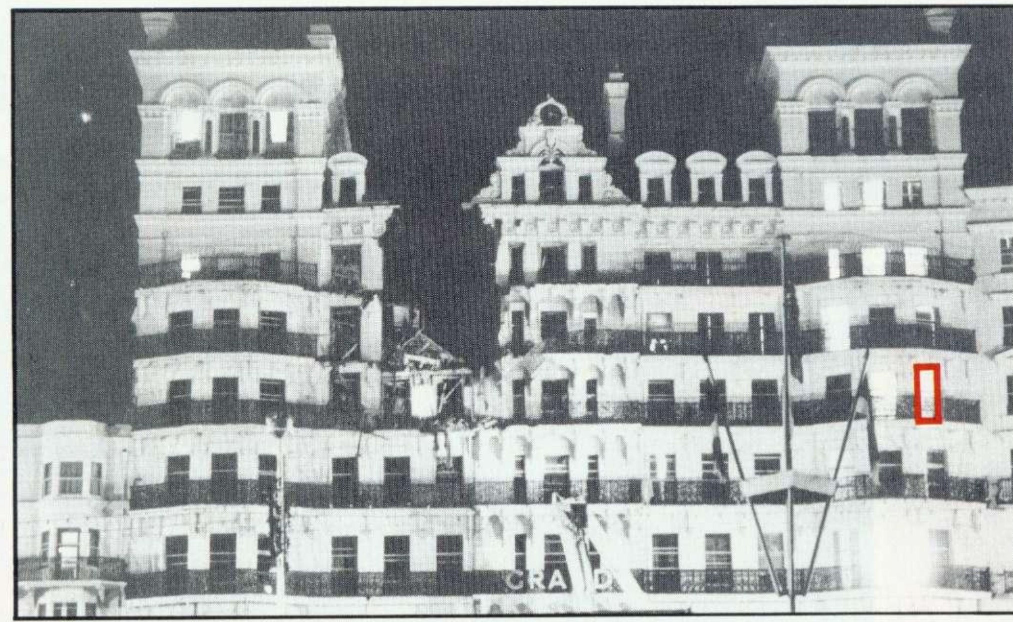
Curry in Brighton bombing

CHRIS Curry, Acorn's managing director and joint founder of the company, was in the Grand Hotel, Brighton when the bomb attack was made against the Thatcher Cabinet.

Curry, a Conservative Party member and strong supporter of Mrs Thatcher, was staying in room 426 (marked in red on our picture) at the invitation of the Party. When the bomb went off at 2.54am on October 12, Curry was in the bar on the ground floor of the hotel.

People in the bar were showered with dust and debris, but no-one was actually hurt. Curry dashed back upstairs to his room, and was later evacuated to Brighton police station. There he gave a statement, but was not taken to hospital.

His luggage, a brown suitcase and fawn briefcase were taken from his room by the emergency services and held by Brighton Police. They were picked up two days later by Lesley de la Mare, Chris Curry's secretary from Acorn's Henrietta St offices in London.



The devastated Grand Hotel after the bomb explosion. Chris Curry's room is outlined in red

Magazine award for 'Acorn User'

AS WE WENT to press, the organisers of the 1984 Magazine Publishing Awards informed us that *Acorn User* was one of the top three in the 'best launch' category.

By the time you read this the final results will have been announced, but the staff at *Acorn User* and everyone else at Redwood Publishing (which is up for a second award with *Expression!*) will have spent three nail-biting weeks waiting for the award dinner on November 16.

The other two finalists are *Just 17* and *Fitness*, so let's hope the first one is over the hill and the second runs out of puff!

We'll let you know how we got on in the next issue – if we've won, no doubt it'll be all over the front cover.

Acorn and BBC go for interactive video

ACORN and the BBC have joined forces with Philips to develop interactive video discs to store computer data and software – a breakthrough seen by many as revolutionising the use of computers in schools and for training.

Acorn and several other companies already have software and interfaces to control video discs and combine the pictures with computer graphics. What these systems cannot do is access computer information on the disc.

The big advantage of video is not just replacing crude computer graphics but the immense storage capacity of a video disc. One can hold a gigabyte of television pictures, data and software per side – one thousand times the capacity of a floppy disc.

The companies are using a cheaper interactive video laser discs where the TV pictures and computer data are stored on a gramophone-like disc protected by a plastic surface. The information is read by a laser which can move to any part of the disc, although it is slower than the head in a disc drive. Philips developed this technology and have since licensed it to others.

Where the breakthrough for computers will come is in the way data is stored on a disc. The problem is that TV is an analogue system whereas computers are digital, so an efficient way is needed to store the computer data in a 'semi-analogue' form.

The hardware is at an early design stage, but already the new type of disc is known as a 'laser disc ROM'. The trio of companies are working to have the new format out by 1986 and establish a world standard.

The appearance of the hardware will coincide with the culmination of the BBC's Domesday Project, the discs for which will be the first to make use of the new technology.

BBC's Domesday – see page 28

Three systems compete

by Geoff Nairn

ACORN has branched out into interactive video with a new product and a new company, Acorn Video. Its Acorn Interactive System (AIS) uses a BBC micro and a Pioneer Laservision video disc player to merge video pictures with pages of text and graphics.

Aimed at the growing market in computer-based training, estimated to be worth £50m a year, the £3,500 system comprises modified Beeb, special colour monitor and Laservision player. For £250 extra the *Microtext* authoring language is included.

A video disc can store up to 55,000 video frames, any one or sequence of which can be called up and displayed on command from a *Microtext* program stored on floppy disc.

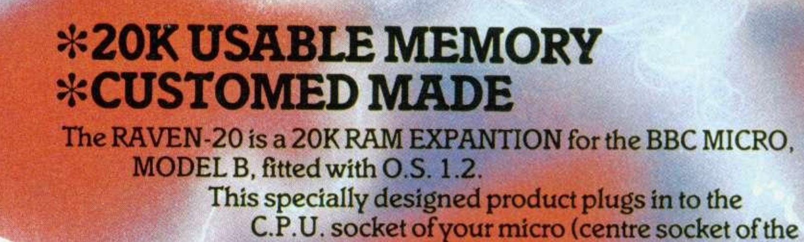
At Barn Hall School in Essex a cheaper interactive video system is being tried out. It uses a standard Beeb and a video cassette recorder.

The Felix Link interface costs £1250 and works with Laservision, VHD video disc, or U-Matic tape machines. A VHS version is in the pipeline.

Felix Learning Systems is on 01-404 5041.

A third system is Interact B, which controls a Thorn-EMI VHD video disc player simply by touching the screen. The unit costs £1500 from Cameron Communications, 041-6330077.

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The RAVEN BOARD provides the user with an extra 20K of usable RAM in screen modes 0 to 3. This together with the aid of software makes the system completely transparent to both the user and the computer.

The RAVEN-20 software ROM gives much more than just the standard commands, it has been programmed to give commands like; "STAR S. SAVE", LOAD for saving and loading the screen, "R. TEST" for testing the board; "STAT" for checking whether Board ON or OFF . . . and many more unique features – not available in any other product.

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3. Fitting and operating instructions (see picture).

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VISA



MP's fury over BT 'censors'

By Bill Penfold

PRESTEL looks like giving the political parties a Christmas present by doing an about-turn on the controversial ruling prohibiting transmission of politics and religion on its open pages.

The ban, actually imposed by British Telecom, sparked off an almighty row, and the signs are that BT is rapidly going into retreat.

The problem the politicians face is that BT has declared politics and religion taboo on teletext . . . lumping them with prostitution and crime.

As we head towards using computerised data, not just for facts, but for opinions, how those systems are controlled will become ever more politically significant.

Proof of this came during the autumn with that 'almighty row' between Labour and BT's chairman, Sir George Jefferson.

Neil Kinnock, on the first day of Labour's Blackpool conference, launched an ambitious Prestel service on Micronet to provide a closed user group for party activists to which the public would not have access.

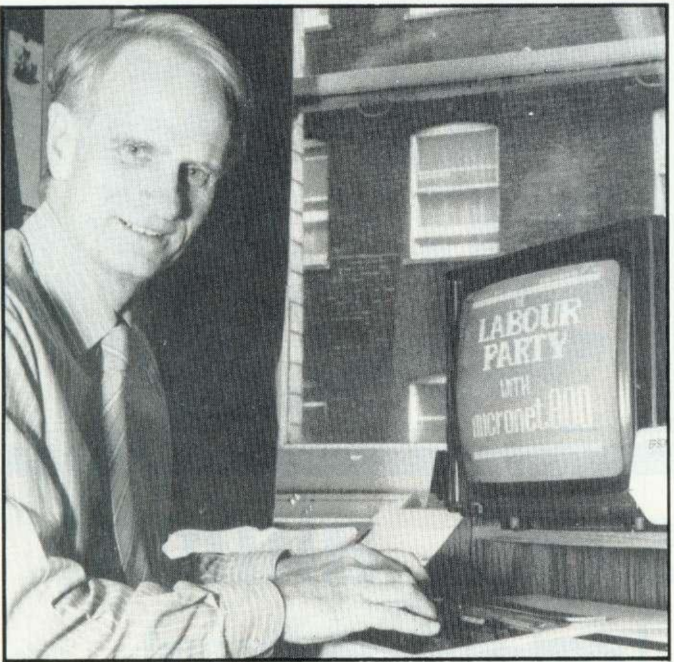
However, the party then decided to include a number of open pages available to everyone, despite Prestel's rules. Sir George discovered what was happening – and pulled the plug.

Reaction was fast and furious. Labour's science and technology spokesman, Dr Jeremy Bray, also chairman of the party's computer advisory group, fired off a broadside.

British Telecom, he claimed, was showing a disturbing presumption in favour of censorship. Strong words.

This raised a fundamental problem for BT as to whether Prestel was like television and radio broadcasting.

Sir George asked for guidance, and a Whitehall working party decided there was no need for legislation. So BT seems to be going through some fairly rapid 'consultations' with the Videotext Industry Association. Bets are on BT dropping its ban.



Dr Bray in happier mood before his blow-up with British Telecom

For Atom software follow the bear

ATOM users can now buy all their software and ROMs from Bearsoft.

This Harmondsworth, Middlesex, company has acquired the rights to Atom software from Acornsoft and to all the Atom system ROMs. Software Classics has transferred the rights on its Atom products to Bearsoft and will be redirecting all orders received.

Bearsoft claims an ambitious programme of developments for the machine, including a new disc interface card. A new catalogue is promised and customer enquiries should be address to: Bearsoft, 168 Harmondsworth Lane, Harmondsworth, Middlesex UB7 0AA, tel: 01-897 3059.

Beeb's musical gift

A MUSIC synthesiser add-on for the BBC micro from Acorn looks like being available for Christmas. Called Music 500, the synthesiser, designed by Hybrid Technology, is expected to cost £199. It can play up to 16 sounds or eight musical voices at a time. It produces a stereo output that can be plugged directly into the AUX socket of an ordinary hi-fi.

The synthesiser is housed in a BBC-beige case and sits alongside the BBC micro connected to the 1MHz bus. It has a self-contained mains power supply.

The sounds that the synthesiser produces are under the direct control of the user. Each channel has high-resolution digital control for pitch, volume, stereo position, frequency modulation (FM), ring modulation and oscillator synchronisation. In addition, separate envelopes may be defined for both pitch and amplitude as a series of line segments. This allows much more sophisticated effects than the standard BBC Basic envelope.

The synthesiser is driven by a specially designed language called Ample, which gives the user complete real-time control over the hardware using a fast interactive compiler. It allows sheet music to be entered quickly from the computer keyboard, incorporating details such as note names, note lengths, accidentals, bar lines, time and key signatures and so on.

A musical keyboard is not yet supported, but Acorn is expected to announce a complete microprocessor-controlled keyboard in the new year.

The Ample language has a vocabulary of words which allow control over the synthesiser in a number of ways. One set of words controls the timbre, pitch, position and modulation of a sound. A second set allows notes and chords to be entered along with their duration (eg, crotchets, semi-quavers, etc). Further words control the playing parameters, including time signature, key signature, speed, number of parts and so on. Once a complete playing script is set up it can be compiled by the language and played back on the synthesiser.

Several pieces or parts can be entered separately and tested in isolation. Once perfected, they may then be linked with other components to produce the final performance. The real-time aspect of the language allows the synthesiser controls to be altered as the performance takes place, opening up possibilities for stage use.

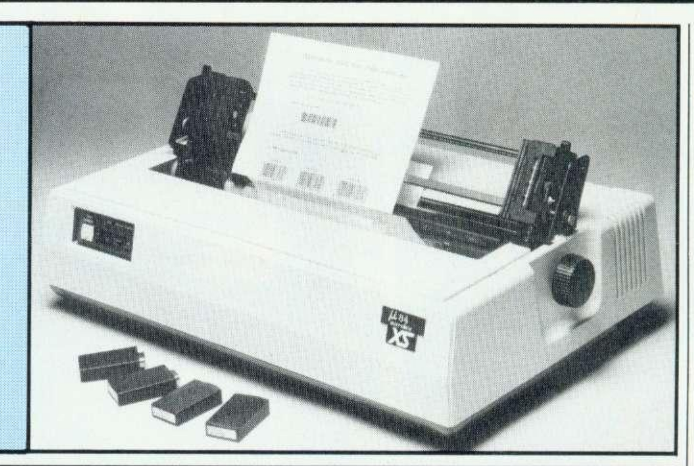
Fourteen pre-defined waveforms (sounds), seven volume and eight pitch envelopes are supplied. An envelope editor allows user-defined envelopes to be created. Music 500 uses a logarithmic volume control which gives extremely accurate control over volume levels.

A waveform editor is expected in the near future.



Eight-part harmony on the Beeb with the Music 500

TOP DOT – Microline has brought out a top-of-the-range dot-matrix printer, the 84XS, costing nearly £1300. The printer uses plug-in modules to allow it to perform different tasks: barcodes, plotting, scientific symbols, Arabic characters and daisywheel emulation. At top speed the 84XS can print 315 characters per second and offers a graphics resolution of 288 dots per inch. Details from X-Data at 750-751 Deal Avenue, Slough Trading Estate, Slough, Berks SL1 4SH.



Add-ons out. .almost

Acorn's 32016, Level 3 file-server and the Electron Plus-3 on show to the public

THE long-awaited 32-bit second processor from Acorn has finally arrived. Using the National Semiconductor 32016 processor chip – as used in the ABC200 – and with 256k of extra RAM, the add-on gives the Beeb real 'number crunching' power and it completes the family of Acorn second processors: Z80, 6502 and now the 32016.

The 32016 is aimed at professional scientists and engineers who require 32-bit precision and it will also run a variety of high-level languages, including Lisp, C, Pascal and Fortran 77. The operating system used is Acorn's own, called Panos, thus scotching rumours that the 32016 would run Xenix (the micro version of Unix).

The 32-bit second processor was first announced in the January 1983 issue of *AU*. Since that time it has been plagued by technical problems and has undergone several name changes, starting life with the nickname 'Gluon', then becoming the 16032 and finally being renamed the 32016. The price is not yet fixed and although it is being previewed at Compec 84 this month, the 32016 will not be available until next year.

Acorn has also brought out a much-improved file-server for the Econet system. Based around a 10Mb Winchester hard disc drive, the Level 3 file-server offers far greater storage capacity to users on the network.

The Winchester drive is also available separately for users of single Beebs who need 10Mb of disc space.

Electron users needn't feel left out, for Acorn has released the Electron Plus-3, a $3\frac{1}{2}$ in disc drive which plugs into the back of the Electron. Prices for both Winchester and Plus-3 have yet to be decided and neither will be available until the new year.

MEP software helps young readers

EDUCATIONAL software for the BBC micro from the West Midlands Regional Centre of the Micro Electronics in Education Programme (MEP) caters for all age-ranges.

The *Pre-Reading Pack* costs £9.30 (£11 on disc) and is aimed at 4-year-olds and above. The *Early Reading Pack* is for the five-to-nine age group and costs the same. Both packs are available from ESM, Duke St, Wisbech, Cambs.

Your Adventure allows children to create their own adventure games (£7.95); *Picture Book* develops reading skills (£11.95); the *Language Development Pack* is a suite of three programs for 9 to 15-year-olds (£9.50); *Maths Talk* teaches simple mathematical statements (£7.95); *Cloze* helps the teacher identify reading problems in students (£7.95); and *Problem Solver* encourages decision-making in secondary level children (£7.95).

These titles are available from LTS, Haydon House, Alcester Rd, Studley, Warks. Prices quoted are for schools and are the same for tape or disc; private customers should add £3 to each price.

Acornsoft has released three educational programs developed by Applied Systems Knowledge for primary school children. *Podd* is about a character who will obey commands that children type in; *Squeeze* is a board game that teaches geometric relationships; and *Juggle Puzzle* is based on a puzzle cube.

Each title costs £9.95 (£11.50 on disc) and is available for both Beeb and Electron from Acornsoft dealers.

Music keyboard responds to the gentle touch

THE Clef Computer Music System is a music synthesiser that is programmed through a BBC micro. It uses digital circuitry throughout and has a touch-sensitive keyboard – the harder you hit it the louder the note.

The CMS, priced at £475 (including VAT), lets the user program in 32 waveforms and 32 envelopes from the Beeb's keyboard and these can then be stored on disc or tape. By combining waveforms together, a full polyphonic sound can be obtained and complete passages of music can also be saved.

Clef Products is at 44a Bramhall Lane South, Bramhall, Cheshire SK7 1AH.

Two-speed modem for phones at £60

PROTEK Computing has brought out an acoustically coupled modem which lets two computer users communicate via a telephone line. It can also access databases such as Prestel and Telecom Gold.

The modem, costing £59.95, has two baud rates: 1200/75 baud for commercial services and 1200 baud for user-to-user communication. Software is supplied that supports both operation modes at £14.95 for the BBC micro. Electron users will be able to buy software and an interface for £24.95.

Protek is looking for large sales at Christmas and will be selling its modem through John Menzies shops – the first time a modem has been sold this way. Contact Protek Computing direct at 1A Young Square, Brucefield Industrial Park, Livingston, West Lothian.

EPROM pro-blow

A NEW EPROM programmer for the Beeb comes from CTL. The Model 423 sells for £109 and is aimed at professional users, say its makers.

As well as being able to 'blow' all modern EPROMs, it can also detect mis-inserted or damaged chips. CTL (Control Telemetry of London) is at Unit 11, Burmarsh, Marsden St, London NW5 3JA.

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CS RANGE

The Single 'CS' range of disk drives all have an independent power supply, with mains lead and moulded plug. They are supplied with formatting diskette, 2-drive connecting cable and comprehensive user manual. Upgrading your system is simple, with Cumana's design in enabling a second disk drive to be added without any modification to your BBC micro computer. All 80 track models are switchable to 40 track models.

CS100 40 Track single sided (100K)	**£159.95**
CS200D 40 Track double sided (200K)	**£203.95**
CS200 80 Track single sided (200K)	**£192.95**
CS400 80 Track double sided (400K)	**£219.95**

*CSX RANGE

A Single disk drive range that excludes the power connector. The 'CSX' range takes power from the BBC micro computer but, comes complete with all the extras of the CS range.

CSX100 40 Track single sided (100K)	**£119.95**
CSX200D 40 Track double sided (200K)	**£165.95**
CSX200 80 Track single sided (200K)	**£159.95**
CSX400 80 Track double sided (400K)	**£189.95**

CSE RANGE

The Cumana 'CSE' range of disk drives all come with an independent power supply and are supplied with all the accessories and benefits of their counterparts. They can be used to upgrade a system, with 2-drive connector cable – supplied with the 'CS' or 'CSX' range – enabling them to be added as a second drive by simply plugging in and switching on.

CS100E 40 Track single sided (100K)	**£149.95**
CS200ED 40 Track double sided (200K)	**£192.95**
CS200E 80 Track single sided (200K)	**£180.95**
CS400E 80 Track double sided (400K)	**£208.95**

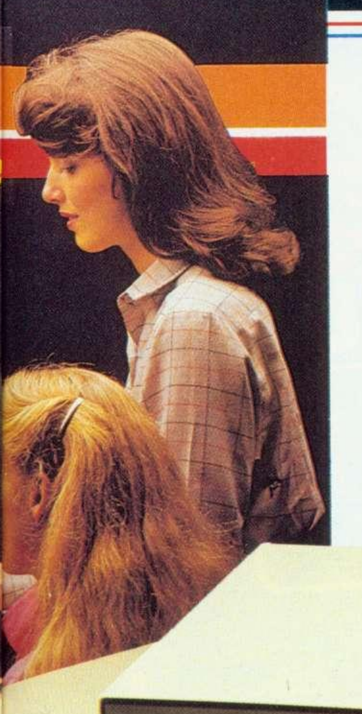
DUAL SWITCHABLE RANGE

The ultimate in disk drives, the 'CD/S' range of disk drives all have independent power supplies, with mains lead and moulded plugs. All supplied with a formatting disk, drive connecting cable and comprehensive user manual; the design enables either drive to be switched independently between 40/80 track modes.

CD200 2 x 40 Track single sided (200K)	**£284.95**
CD400/S 2 x 80 Track single sided (400K)	**£359.95**
CD800/S 2 x 80 Track double sided (800K)	**£414.95**



SSHOULD
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Cumana's design includes an independent power supply* – complete with mains power supply lead and insulated plug. Each disk drive comes with a comprehensive user guide and formatting disk.

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Cumana's range of disk drives is also compatible with Spectrum, Dragon, Oric, Tandy models I, III and 4 and Video Genie:









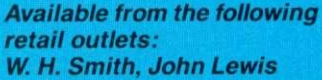
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Audio & Computer Centre (Jersey)
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Eltec (Bradford) 0274-722512

Gwent Computers (South Wales)
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Microage Distribution
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Thompson Cook (Birmingham)
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BES saves the osprey

OSPREY! is the first in a series of novel educational simulation programs being produced by Bourne Educational Software. Developed in conjunction with the Royal Society for the Protection of Birds, the game is concerned with protecting the Scottish Osprey from hunters and tourists.

The tape costs £9.95 for the BBC micro or Electron, and disc versions cost £11.95 (£15.95 for 3in format).

BES is at Bourne House, The Hundred, Romsey, Hampshire, SO5 8BY.

Mr T takes off

MR T continues on his way with five more educational programs in Ebury Software's Early Learning series. Aimed at four to eight-year-olds, the five Beeb titles are: *Mr T Meets his Match; Mr T in the Mystery Maze; Mr T's Jungle Stories; Mr T's Simple Sums;* and *Mr T Makes Music*. The last is also available for the Electron, and all cost £9.95 on tape.

Micro accounting

SYSTEMATICS International has produced two accounting packages for the small businessman to run on the BBC micro.

Sales and Purchase Ledger handles 400 different customers and suppliers, *Stock Control* and *Invoicing* holds 1000 stock lines and has integrated invoicing. Both have comprehensive manuals and cost £89.

Systematics International Microsystems is at Cleves' House, Hamlet Rd, Haverhill, Suffolk.

Epson conscripts

WORDWISE users can now get extra printing features with Astrosoft's *Printwise* software, designed for the Epson range of printers. The £12.50 utility program allows easy use of subscripts and superscripts, italics and different typefaces. It can also print Greek characters and scientific symbols.

Details from Astrosoft at 39 Latimer Way, North Pickenham, Swaffam, PE37 8JD.

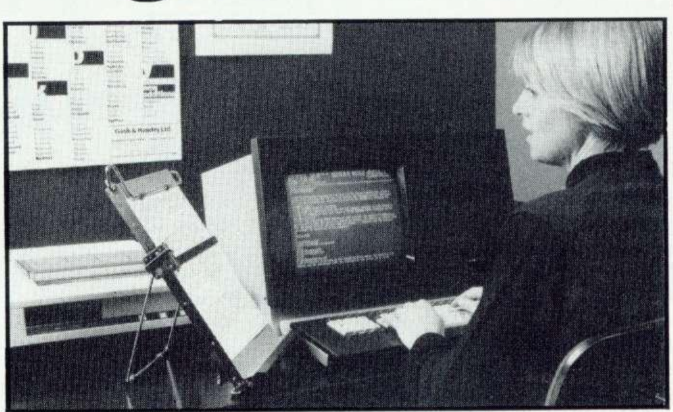
Typesetting on a Torch

TORCHSET is a Torch-based system that will take raw copy from a wordprocessor and turn it into a finished page ready for printing. By using a Torch computer or an enhanced BBC micro, an electronic typesetting system can be set up for half the cost of other systems, according to the makers, Torchset Systems. In addition, Torchset offers extra features such as Torch Mail Plus electronic mail and the Torchnet local communications network.

The cheapest Torchset system costs £5500 and consists of a single Torch CF500 computer with a customised keyboard, Torchset software and the interface to connect the computer to a phototypesetting machine. So far, only the Linotron range of phototypesetters are supported.

More expensive systems consist of several Torch machines networked via Torchnet, an enhanced version of the Beeb's Econet. Using the network, one computer is for wordprocessing and the files are sent to another Torch machine for typesetting. The Torchset software permits various typesetting commands to be 'imbedded' in the text.

Further details from Torchset Systems on 061-834 8564.



Torch with modified keyboard and running Cora 5, a language devised for the Linotron typesetters

Micro Live discs snatched

THE theft of discs and hardware delayed the appearance of BBC TV's bulletin board after the first *Micro Live* show.

A total of £1550-worth of equipment went missing over the weekend after the Friday night show, said technical consultant Steve Lowry.

Among the items were a Floppy, disc drives and QL, but luckily none of the BBC micros for the show.

'The bulletin board was set up on a Tandy running the tried and tested TBBS software,' said Lowry. The configured TBBS discs were taken and this delayed the bulletin board until Tuesday.

But the weekend wasn't all bad news for *Micro Live*. Just after the show the Controller of BBC2 phoned the team to say it had gone so well that the show would be repeated on the Saturday. Viewers can ring the bulletin board to make comments on 01-579 2288.

Telecom Gold users can get the same material by typing INFO BBC. If you have a telesoftware adapter you can access the information on Ceefax.

'Sardine' skills boost utilities

BEEBUGSOFT is releasing a variety of firmware and software products for the Beeb and Electron in time for the Christmas spending spree.

Top of the range comes *Sleuth*, a Basic debugging tool for the BBC micro. Costing £29, *Sleuth* allows you to single-step through your Basic program either statement by statement or block by block. Dual screen operation allows the user to toggle between the program screen and *Sleuth* control screen, allowing the program to be accessed directly while it's running to display or alter program variables, for example.

Breakpoints may be set to pause the program's operation when a specific line-number is reached or even when a variable attains a predetermined value. The operational speed of a program may be adjusted as it is running, allowing freeze-frames of areas of interest such as graphics displays.

Exmon II is an enhanced version of the original *Exmon*, extending its vocabulary to 60 commands. Its main feature is its use of dual screens, which allows you to switch between *Exmon*'s control screen and your own screen.

Owners of *Exmon* on EPROM will be allowed a 50 per cent discount on upgrading to version II.

Exmon I is now available for the Electron on cassette. The ROM-based version of *Exmon II* is available for the Elk as well, though this doesn't support the dual screen facility; this is £2 cheaper than the Beeb version at £27. Also now available for the Electron is *Toolkit* at £27.

Help is an information ROM for the BBC micro. Sardine canning expertise has crammed more than 13,000 text characters into a mere 8k, on various aspects of the Beeb's operation.

Murom is a sound extension ROM for the BBC micro that allows you to create and edit your own sounds.

Masterpieces may be saved or played back with or without *Murom* fitted, and may be interrupt-driven. *Murom* costs £29 and *Help* costs £25.

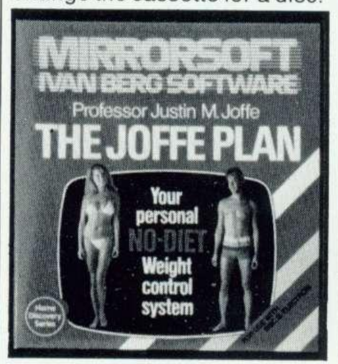
Seven new disc packages from Beebug also make an entry.

Mirrorsoft gets personal

MIRRORSOFT has foresaken the traditional arcade-style games market with its 'Home Discovery' series of programs for the Beeb and Electron, which are intended to appeal to parents just as much as kids.

Titles in the series include: *The Joffe Plan*, a weight-loss program which doesn't involve dieting; *Know Your Own Psi-Q*, which tests your psychic powers; *Know Your Own Personality*, which does a personality evaluation; *BBC Mastermind*, a computer version of the television quiz; and *Star Seeker*, an astronomy program which plots positions of stars and comets.

All titles cost £9.95 from usual dealers and, apart from *Star Seeker*, will work on the Electron as well as the Beeb. Disc versions cost £3 extra and – other software houses please take note – if you buy a tape version and at a later date want to upgrade to disc, for just £3 extra Mirrorsoft will exchange the cassette for a disc.



Compatibility for Commodore drives

SCHOOLS and colleges with discarded Commodore peripherals can now use them with their BBC micros, thanks to a company called Intelligent Interfaces.

The company's Syscon 6 interface allows the complete range of Commodore disc drives, which many schools bought to use with the old PET computers, to work with the Beeb. It costs £179.

Also available is an interface for the Motor Shark range of Winchester hard discs which has an Acorn-compatible filing system.

Further details on 0789-296879.



Patent clash over boards

ARIES-B20
Add 20K to your BBC micro in five minutes

ARIES Computers looks set for a legal battle with Raven Micro Products and Watford Electronics over what the company alleges to be infringement of the patent under which it produces its B20 memory expansion board for the BBC micro.

The Aries-B20 board, providing an extra 20k of RAM, was formerly sold at £115, but the price was reduced to £69.52 during the Acorn User Show in August. That was where Raven launched its Raven 20, a 20k RAM expansion board priced at £69.95.

Peter Headland, managing director of Aries, said: 'It's a cheap imitation of the Aries-B20 and uses out-of-tolerance chips. They can expect a lot of unhappy customers.'

No Mercy

Aries filed a patent on the design earlier in the year which has now been published (GB 2 137 382 A) and according to Mr Headland: 'It's an exact description of both the Raven and Watford Electronics boards. Now that the specification is published they can expect no mercy. We are determined to seek full compensation.'

Mr Headland claimed that he went incognito to the Raven stand at the AU Show. 'They freely admitted that it was a cheaper version of the Aries board and that it uses the same memory banking switch technique that is the subject of our patent.'

Chris Sykes, Raven's managing director, dismissed the patent as irrelevant: 'It covers the use of paged RAM, which has been around since the late '50s on early valve computers.'

In a specially-prepared press statement his company said: 'The Raven 20 has a number of features which are not found on the Aries B20: the sophisticated design of the Raven 20 makes . . . use of chips supplied by extremely reliable manufacturers. This, coupled with a highly cost-effective design utilising the latest technology with dynamic RAM and modern flow-solder production, has enabled us to set up a highly competitive sales price.'

Watford Electronics has also reacted to Aries' publication of the patent by issuing a statement saying: 'The initial reaction from a number of respected engineers is that the document describes no new techniques.'

Watford's managing director Mr Nazir Jessa said: 'If the Patent Office were to accept Aries' specifications we'd all have to stop producing anything. They are re-inventing the wheel. RAM expansion and piggyback boards are used everywhere,'

Watford

Watford's statement said that components of its 32k expansion board (advertised at £69) are 'sourced directly from at least two major semiconductor manufacturers and are full spec. devices.'

The Watford system 'makes available an additional 32k of RAM, all of which can be used, and a printer buffer, a facility not available in any other RAM cards'.

Elite 'on target for 100,000'

ACORNSOFT is looking forward to a prosperous New Year and it's all due to *Elite*, its spaceflight simulation game.

Two weeks after its launch in September, 13,000 copies of the game had been sold and it entered the top five in a weekly software chart.

By the New Year, the company is predicting sales exceeding 100,000 – more than double that of any other Acornsoft game.

Elite, available for both Beeb and Electron, mixes arcade-style graphics into an adventure game. David Johnson-Davies, Acornsoft's managing director, claims: The success of *Elite* proves that the games market is very much alive.'

Which is just as well, for Acornsoft has brought out three more games, initially just for the Beeb. In *Boxer*, the player has to catch balloons which a girl drops and so win the girl's attention. *Black Box* and *Gambit* are two strategy games on one tape, and *Seventh Star* is a 'witty adventure game'.

For those with a weight problem, Acornsoft's *Watch Your Weight* should let them do just that. Costing £11.90, the program works out your ideal weight.

On a weightier note, *P-System* is a program development package for the Beeb's 6502 second processor. At £299 it's the most expensive pair of discs you're likely to own, offering compilers for UCSD Pascal and Fortran 77.

Beeb gains a voice for £25

FOR just £25 your Beeb can start talking with a speech synthesiser board produced by Cheetah Marketing. The *Sweet Talker* plugs into the micro's IC99 socket and uses the allophone method of speech synthesis. The various phonetic sounds are represented as numbers and are sent to the *Sweet Talker* by using DATA statements.

Cheetah Marketing is at 24 Ray St, London EC1R 3DJ.

YES!

"On-board" microprocessor.

Electro magnet to pull motor spindle onto tape.

Nine track "byte-wide" head.

Tape drive spindle.

Precision ground rubber pressure roller.

Twelve foot long loop of tape freely packed into cartridge.

PHLOOPY 100k cartridge, shown not yet pushed fully home.

A 100k BBC-drive for £99 + VAT

We've done it! We've built a storage system for your BBC Micro with the power and convenience of a floppy disk drive, at a fraction of the price. Interface to the BBC costs £26 + VAT and runs up to 8 drives.

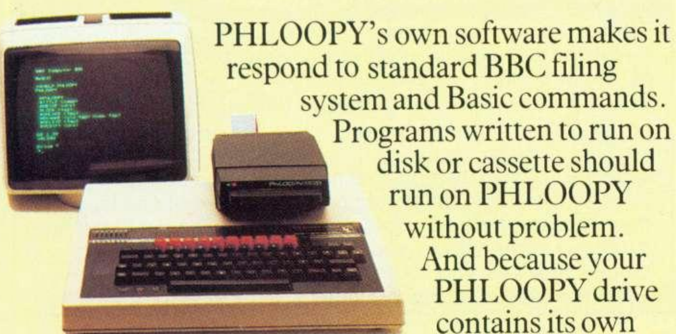
PHLOOPY's special secret

PHLOOPY does not record on a disk, but on a loop of quarter-inch tape contained in a rugged interchangeable cartridge.

The heart of PHLOOPY is a unique "byte-wide" magnetic head, that gives it its speed by recording nine tracks across the tape. Typically, you can access a file in only 3 or 4 seconds.

If you're used to waiting for a cassette tape to trundle programs into your BBC, you'll be amazed at PHLOOPY's performance – up to 100 times faster.

Talking to your PHLOOPY



PHLOOPY's own software makes it respond to standard BBC filing system and Basic commands. Programs written to run on disk or cassette should run on PHLOOPY without problem. And because your PHLOOPY drive contains its own microprocessor – a second computer which does most of the hard work – it puts very little load on the BBC. The on-board computer also checks and automatically corrects any read errors.

Your PHLOOPY Library

PHLOOPY cartridges hold a full 100k of data. You can buy blank cartridges for £3.75 each plus VAT. Many BBC programs will be available on PHLOOPY.

Phi Mag Systems Ltd. PO Box 21, Falmouth, Cornwall TR11 3TD Tel: (0326) 76040

Order Form

- Please send me further details about the PHLOOPY 100k data storage system for the BBC Model B.
- Please send me______(qty) PHLOOPY starter pack(s) for my BBC Model B microcomputer, including PHLOOPY drive, BBC interface, leads, connections, operating system in firmware, manual, and two PHLOOPY 100k cartridges, at £147.75 each including VAT, postage and packing. Amount £______
- Please send me_____(qty) packs of 5 PHLOOPY cartridges at £19.75 including VAT, postage and packing. Amount £______

I enclose a cheque/PO for £______ OR Please debit my Access card Number: ______

Your order will be acknowledged within 10 days, giving a delivery date.

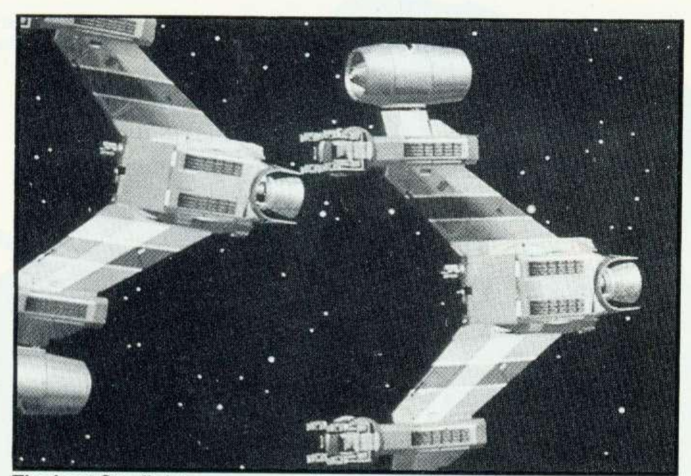
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14 day money-back option.

AU 12


The Last Starfighter – a computer graphic showcase

Computer graphic showcase of film

IF YOU want to see what computer graphics are capable of, go and see *The Last Starfighter* which will be in the cinemas before Christmas.

It features 230 scenes totally created by computer which add up to a fifth of the film's 100 minutes of running time.

Last Starfighter tells the tale of a video games whizz-kid who, by reaching the high score in a computer game, qualifies as a starfighter pilot. He then joins the fleet trying to beat off the marauding hordes of hostile aliens who are threatening earth and its allies.

However, by devious treachery, enemy agents are able to destroy the earth fleet – leaving whizz-kid Alex as the planet's only hope.

The graphics were all done in the US by Digital Productions of Los Angeles.

Computer nasties

THE Bright Bill banning video nasties notwithstanding, Palace Software has released a game for the Beeb based on the horror film *The Evil Dead*. Despite the film's getting a British Board of Film Censors certificate, the video version had to stand trial alongside real nasties such as *I Spit on your Grave* and *Driller Killer*, which Bright tried to stamp out.

The software version of *The Evil Dead* is unlikely to find itself in court, though it still has the film's evil spirits, gruesome monsters and deadly weapons. The game costs £7.99 from the usual dealers.

Planned for next year are software versions of two more films, *Halloween* and *Company of Wolves*, and there's even talk of a game based on the stomach-turning *Texas Chainsaw Massacre*.

On television

Micro Live, BBC2, December 7, 6pm. Christmas is just around the corner and this month's programme has a festive flavour. Lesley Judd presents a potted history of computer games, which always sell well at Christmas, and talks about a very hush-hush laser disc game. Mac (Ian McNaught-Davis) will be using his Beeb to draw a Christmas card and the software he uses will be available on the Ceefax telesoftware service. Also, there will be a few Christmas present ideas for micro owners.

Computers in Control, BBC 2, Fridays 12.30pm. Repeat of programmes from the BBC's Computer Literacy Project. Introduction to robotics and control applications of microcomputers.

The Computer Programme, BBC 2, Fridays 12.05pm. The series that started it all off way back in 1982, being repeated for daytime viewers.

Making the Most of the Micro, BBC 1, Sundays 12.35pm. This series and the above two will be repeated again in the spring.

On radio

Chip Shop, BBC Radio 4, Saturdays 4.15pm (repeated on VHF at 11pm Tuesdays). On November 17 the programme will be broadcast live from Scotland's so-called Silicon Glen, with Barry Norman showing us around some of the area's new technology industries. Look out also for the *Chip Shop Christmas Special* on December 15.

Take A Byte, BBC Radio Lancashire, Sunday, December 16 at 11.05am (repeated at 6.35pm on the following Tuesday). Monthly programme.

In general

IF the recent *AU* articles on using your Beeb to receive weather satellite and RTTY signals have sparked off some interest, then for £5 you can join the British Amateur Radio Teleprinter Group (BARTG). The group covers all aspects of data broadcasting and it has its own journal and a weekly radio news bulletin.

Details from Stuart Dodson, callsign G3PPD, 63 Malvern Avenue, South Harrow, Middx, HA2 9EV.

THE International Adventure Club exists to provide help for adventurers in distress. In addition it produces a newsletter and does various special offers. The IAC is at 10 Ennis Close, Harpenden, Herts AL5 1SS.

PRESTEL's message service, Mailbox, is now available nationwide at local call rates. Mailbox allows subscribers to leave short messages for other subscribers to read when they log on. The service is free, excluding normal Prestel charges.

BOOTS is setting up centres inside 23 of its larger stores to sell solely Acorn machines, along with software and peripherals.

In print

HERE's a shameless plug for our *Acorn User* authors. There's technical editor Bruce Smith's new book, *Electron Assembly Language*, published by Shiva at £7.95, and *Assembly Language Programming for the Acorn Electron*, an update of Ian Birnbaum's original BBC book from Macmillan.

Two complementary books on graphics: *Graphics Programming on your BBC Micro* and *Graphics Programming on your Electron*, both by Jim McGregor and Alan Watt, Corgi/Addison Wesley, £4.95. By the same authors and publishers is *Better Basic for your Electron* at £4.95.

In *Women and Computing* Rose Deakin asks why women are not joining the computer revolution and suggests a few remedies. The book is produced by Papermac at £5.95.

Addresses

Acorn Customer Services, 0223-210111
Chip Shop's Chipline
London 01-790 3400
Liverpool 051-236 8474
Bristol (0272) 279494
Birmingham 021-355 6144
BBC Broadcast Support Services, PO Box 7, London W3 6XJ, 01-992 5522

On show

Compec, November 13-16, Olympia, London.
East Midland Computer Show, November 16-18, East Midland Conference Centre, Nottingham.
Electron & Micro User Show, December 6-9, Royal Horticultural Hall, London.

Blunderbox

TWO errors crept into the Top of the List feature on page 99 last month. Line 260 should read:

```
260 LDA #&40
```

though it will work on the Acorn DFS as it stands, the Watford DFS will issue a channel error if this is uncorrected.

To save the machine code use the following line:

```
*SAVE ISAVE 8D0 9B0 8D0
```

IN Harry Sinclair's concluding sprite designer article we did not supply Electron users with the changes they need to make to the original listing to allow it to function correctly. Six lines need to be changed as follows:

```
10*KEY10PA.=&1900¦MOLD¦M
290COLOUR6:PRINTTAB(2,0)
"Press DEL when"";TAB(2)
"design finished":COLOUR3
430UNTILINKEY (-90)
520PRINTTAB(0,2)" Data goes
from &1300 to &";~base
%+3*?&12EF:PRINT";char%;"
characters defined (0 to ";char%-
1;")."
530PRINT''" Table of addresses
is @ &12FO to &";~&
12FO+cha%*2-1
1750PRINTTAB(7,3);" SPRITE
DESIGN"
```

Bruce's brainteaser

THIS one nearly drove your friendly Technical Editor barmy! See if you can explain why the following 'program', supplied by Robert Wood of Birkenhead, does what it does! It's actually a one-liner, so proceed as follows. First type in:

```
10G.10:
```

Note the colon at the end, and make sure you *don't* hit return. Now for the subtle touch. Move the cursor left five places so that it sits under the G. Hold down the copy key until the line is full (six screen lines) and a bleeping is heard. The final act simply requires you to press the return key. We'll let you know the reason why next month.

TECHNOMATIC

BBC Computer & Econet Referral Centre
17 Burnley Road, London NW10 4ED 01-208 1177

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and 15% VAT to order value

Xmas Special

A complete Professional Word Processing System

PLUS FOR THE KIDS AS AN XMAS BONUS

A FREE lightpen with supporting Software or Acornsoft's Elite. See Star Bargain

ACORN COMPUTER SYSTEMS

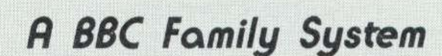
BBC Model B Special Offer	£320 (a)
BBC Model B + Starter Pack	£348 (a)
BBC Model B + DFS	£409 (a)
BBC Model B + Econet	£389 (a)
BBC Model B + Econet + DFS	£450 (a)
BBC Dust Cover	£4 (d)
Pair of Joysticks	£14.50 (d)

UPGRADE KITS

A to B	£65 (d)	Installation	£20
ACORN DFS Kit	£95 (d)	Installation	£15
Econet Kit	£55 (d)	Installation	£25
Speech Kit	£47 (d)	Installation	£15

ECONET ACCESSORIES

Terminator (Two reqd per installation)	£31 (c)	File Server Level II	£216 (c)
Clock with psu	£35 (c)	10 Station Lead Set	£26 (c)
Printer Server Rom	£42 (c)	Extra Econet cable	£1.50/m (d)
File Server Level I	£86 (c)	Econet User Guide	£10 (d)



A BBC Family System

ACORN BITSTICK

The renowned CAD package, providing unprecedented graphics facilities for the draftsman, engineer and graphics student — a 'word-processor' for graphics. Allows accurate drawing ... ines, circles, curves etc — colours can be easily chosen from a pallette. ... is a FX80 dump routine easily ... om facility allows a part of a ... a drawing to be magnified ... to 48 drawings on a disc ... library system for easy ... d easy to use allowing ... on the edge £328 (a)

STAR BARGAIN
Complete Word Processing System for only £1175 + VAT
Comprising: BBC Model B + DFS
2 × 400K 40/80T Dual Teac Disc Drive
(ideal for future upgrade for Z80)
Sanyo/Kaga Hi Res. Green Monitor
Juki 6100 Daisywheel Printer
Acorn 'View' Word Processor
Juki Printer Driver
All necessary Cables, Manuals etc.
and as an Xmas bonus for the kids!! we are including a Light-Pen with Software! or Acornsoft's Elite. The choice is yours.



... the ... 8000 cpu ... a UNIX operating system, or set up a network of upto 254 machines. All these capabilities are available NOW.

TORCH UNICOMM

For the Torch Z80 card user, comes a superb communications package. A BT approved modem using 1200/75 and 1200/1200 baud is supplied complete with BBC RS232 cable. Three fuperb software packages in CP/M are supplied complete with BBC RS232 cable. Three superb software packages in CP/M are supplied — these clearly show that Torch are not new to the 'communications scene': UNIVIEW for PRESTEL type use, allowing saving of frames, downloading of files etc. UNITERM is a sophisticated terminal emulator. UNIMAIL is an amazing package specifically for TORCH users. Among other facilities, it allows messages and files to be accessed from distant machines — access to files can be controlled by hierarchial passwords. Hardware + software: £159(a)

ACORN Z80 2nd Processor

This processor converts your BBC into a complete business micro with all the computing power a professional would need. The system is CP/M based and is supplied with a very extensive software package. The package includes three office productivity programs, (memoplan, fileplan and graphplan), Systems generator program, three programming languages plus the ACCOUNTANT business program. Software is accompanied by extensive manuals that not only get you started but also answers your whys and hows.

All for only £399 (a) (incl VAT)

ACORN 6502 2nd Processor

This processor is designed for the serious computer user who wants to get even more out of his computer. This processor provides increased memory — allowing up to 44K for Basic programs and up to 60K for assembly language programs, regardless of screen mode in use. (ideal for VIEW). An increase in speed means that programs run up to 50% faster. The second processor/BBC combination offer computing power comparable to systems costing twice as much. £175 (a)

TORCH GRADUATE SYSTEM

The ultimate upgrade — converts your BBC into a powerful 16 Bit business computer and makes it disc and hardware compatible with the IBM PC. (will run Lotus 123!). With 256K RAM and single/dual drives, it simply connects through the 1Mhz bus. (The disc drives can be used in both BBC and IBM mode, without requiring a disc interface.) The top-of-the-range Model G800/2 comes complete with the superb Xchange range of software, and includes a full-feature word processor, a financial planner, a database and a business graphics package — all 'linkable'.

G800/2: £945(a) Full Spec. & prices on application.

Z80 Card ZEP100 with PERFECT Software Packages + Z80 Basic	**£299 (a)**
Z80 Disc Pack ZDP240 with software as above	**£699 (a)**
20Mb Hard Disc + 1 × 400K Floppy Drive	**£1,950 (a)**
UNICOMM Communications Package + modem	**£161 (a)**
Unicorn 68000, Unix OS/Z80B/256K, 20MB Hard Disc, 400K Floppy	**£2995 (a)**



PRINTERS

ALL PRINTERS HAVE A 12 MONTH GUARANTEE

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KAGA TAXAN:
* Epson Compatible Control codes
* 80 or 156 Column
* NEAR LETTER QUALITY Print using 23 x 18 matrix
* Text Modes include Normal, Italic, Enlarged, Condensed, Super/Sub Script, Proportional
* Dot Addressable graphics in various modes
* 3K buffer which can also hold user defined characters
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KP810 (80 coloumn) **£249 (a)**
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The industry standard printer offering the quality, reliability and versatility.

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BROTHER HR15: • 14 cps • 3K Buffer • Two colour printing • Porportion spacing • Underline • Bold & Shadow printing • super/Sub script + many other features.

BROTHER HR15 **£349 (a)**

JUKI 6100: • 15 cps • 2K Buffer • Switchable 10/12/15 cpi • Proportional printing • Linear Motor for max reliability.

JUKI 6100 **£340 (a)**

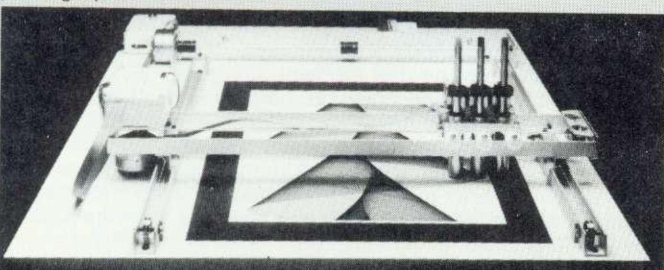
VIEW PRINTER DRIVER FOR FX80/KP810

This driver allows the use of all FX80s fonts to be used in text written using the VIEW rom. If user defined characters are held in the printer buffer they can also be used within the text. Manual and Disc includes examples of document layout and user definable characters. Supplied on 40 or 80 Track disc................................**£7(d)**

Printer Drivers for NEC PC8023, Brother HR15 and Juki 6100....**£7(d)**

GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without loosing the accuracy. The servo controlled drill/router, and scriber can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs.



Workstation Complete **£490(a)**
Basic Plotter **£270(a)**
Drill/Router Attachment **£79(c)**
Opto Sensor **£72(c)**
Power Supply: PS12V **£42(c)** PS24V **£78(c)**

TECHNOMATIC

All prices exclude VAT

PRINTER ACCESSORIES

EPSON
Paper Roll Holder **£17(d)** FX80 Tractor Attachment **£37(c)**.
Interfaces: 8143 RS232 **£28(c)**; 8148 RS232 + 2K **£57(c)**; 8132 Apple II **£60(c)**; 8165 IEEE + Cable **£65(c)**.
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 **£5.00(d)**; RX/FX/MX 100 **£10(d)**;
FX80 Dustcover **£4.50(d)**

KAGA TAXAN: RS 232 Interface + 2K buffer **£85(c)**; Ribbon KP810/910 **£6(d)**

JUKI: RS232 Interface **£65(c)**; Spare Daisy Wheel **£14(d)**; Ribbon **£2.50(d)**; Sheet Feeder **£199(a)**; Tractor Feed Attach **£99(a)**

BROTHER HR15: Sheet Feeder **£199(a)**; **Ribbons Carbon or Nylon £4.50(a)**

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PRINTER SHARER/BUFFER

A unique printer sharer/buffer that provides a simple way to improve the utilisation of the installed equipment by reducing the waiting time for printing documents. All but the smallest documents tie up the computer while being printed and the computer remains out of use until the printing is complete. This is more so in a network which does not have a dedicated computer for printer operation. This buffer/sharer would free the computers almost immediately for other uses and in many cases make the use of dedicated printer server machines unnecessary.

* Standard Centronics interface with 3 inputs.
* Each input port scanned every 5 secs to check for data. Switching between ports completely automatic.
* Data input rate 4800 bytes/sec
* LED Bargraph indicates percentage memory used.
* COPY key allows current document to be reprinted.
* Internal check to prove the data integrity.
* PAUSE switch allows printing to be stopped temporarily to allow paper change, adjust form feed etc. or allows temporary storage for large number of small files which can all be printed together.



* RESET allows all buffer memory to be cleared without having to hard break on the computer.
* 64K buffer capacity. * Mains powered * Compact 7cm × 17cm × 24cm

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Cable Set **£30**

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Three Computers to one printer (parallel) **£65(b)**
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A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 × 192mm + menu area. Comes complete with a CAD package. **£110(b)**.



COMMUNICATIONS

We offer the customer a choice of BT approved modems and suitable communication software, enabling the user to choose an ideal cost-effective system, perfectly suited to his individual needs. We stock modems for every requirement, whether it is for the business, or private user, whether you require access to a public database, bulletin boards or a mainframe, whether for local or international use.

MODEMS

TORCH UNICOMM See our section on Torch for further details.

ACORN PRESTEL The dedicated Prestel adaptor complete with integral, BT approved, auto-dial modem and software in ROM **POA.**

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as intercomputer communications. It conforms to CCITT V21 300/300 Baud standard. Battery/mains powered **£55(c)** BBC Lead **£3.50** External PSU **£8.**

WS2000 A world standard, BT approved, direct connect modem switchable between 75,300/300,600, 1200/75, 75/1200 baud. It is compatible with Bell 103/113/108, 202 and CCITT V21 & 23 standards and allows you to communicate with virtually any computer system in the world. This is the new generation modem that was chosen by the BBC to demonstrate a totally reliable USA-UK data link live on TV — it performed faultlessly in front of an audience of millions. This modem will cover Prestel, Micronet, Telecom Gold, Distel, Microweb, One-to-One, Bulletin Boards both in the UK and abroad, etc. etc. as well as user-to-user communication. It also has a rather useful facility of 'Reverse-Prestel' mode i.e. 75/1200 so that you can communicate with other users who only have a standard 1200/75 type modem. What possibly gives this modem its biggest advantage is its option of computer controlled switching between all modes of operation. In addition, separate auto-answer and auto-dial cards are available, giving this modem possibly the greatest potential of all. Mains powered. **£129(c).** Data Cable **£7** Auto Dial Card **£30(d)** Auto Dial Cable **£4** Auto Answer Card **£30(d)**



Unique menu driven software on disc to configure COMMSTAR to run correctly with the WS2000 modem. **£9.95(d)** (please specify 40 or 80 tracks)

TELEMOD-2 A BT approved modem complying with CCITT V23 1200/75 Duplex & 1200/1200 Half-Duplex standard, that allows communication with Viewdata services e.g. Prestel, Micronet etc., as well as using 1200 Baud for communicating with other computer users. Mains powered. TELEMOD 2 **62(b)** BBC Lead **£7.00**

TERMI This is a semi intelligent terminal emulator allowing the BBC to act as a dumb terminal, slave BBC graphics terminal, or VT52 terminal. The rates at which data is sent or received is easily set up with rates of up to 4800 Baud with 40/80 col. selectable. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Termi is not suitable for PRESTEL). **£28(d).**

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). **£59(d).**

COMMSTAR This intelligent communication facility is extremely easy to use yet very versatile. It features a terminal mode and a special PRESTEL mode. In Terminal mode, all input may be copied into a buffer in memory over which full control is provided. Controls of protocols is very simple and any type of file (not just ASCII) may be sent using XModem protocols. The Emulation mode may be used using a disc based emulation file to emulate virtually any terminal type within the capabilities of the BBC. In PRESTEL mode all normal Prestel features are available, including downloading of software, saving and retrieving of pages etc. etc. **£29(d).**

TECHNOMATIC

All prices exclude VAT

EPROMER II

Our current version of the highly popular Eprom programmer is now being enhanced to provide more and better facilities for easy programming by the user. The software will maintain its superiority over all currently available similar programmers. The range of eproms handled has been widened to include the eproms with lower programming voltage and eproms which can be programmed using the fast algorithm. Control of all operations has been moved to the keyboard. The screen display has been improved to give more information. The screen editing facilities have also been modified to simplify the data entry.

Preliminary Information

* The new Eprom Programmer will now program 2516, 2532, 2564, 2716, 2732, 2764, 27128 and 27256 + 5V eproms, and all but the 27256 in a single pass.
* The programmer will be supplied with integral power supply, and interfaces with the BBC via the 1MHz bus. It is fully buffered and complies with Acorn protocols. There is no power drain from the computer.
* No knobs or switches to fiddle with — total control from the keyboard.
* Fully software driven with easy to understand instructions displayed on the screen.
* Eprom type selectable from the keyboard.
* Selectable programming voltage 25/21/12.5V.
* Defaults to normal programming with high speed algorithmic programming selectable, for a device with suitable capability.
* Continuous screen display of eprom type, option and address range selected.
* Full screen editor with HEX or ASCII input. Constant display of logical eprom address.
* Can read, blank check, program and verify at any address/addresses on the eprom.
* Full Tape/Disc filing facility.
* Several basic programs can be entered on a single eprom and called up with individual name.

£102(b)

ATPL SIDEWISE ROM EXPANSION BOARD

This is a well constructed expansion board that does not require soldering in its installation. It will give you an additional twelve sockets, with 16K battery backing option. This extra bit of parts includes a nickel-cadmium battery, allowing any software stored, to be retained for future use when the BBC is switched off. Several link-selectable options include the choice of type of Eprom, and a 'write protect' for the RAM option. All the buses are fully buffered. **£39(d)** Battery Back-up Kit **£18.**

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The Original 'Infinite Speech' Synthesiser — Still the Best!

A ready-built totally self-contained speech synthesiser unit, attractively packaged with built in speaker, Aux. output socket etc. Optimum sound quality is achieved due to a tailored frequency response audio stage. It allows the creation of any English word with both ease and simplicity, while, at the same time, being very economical in memory usage. You can easily add speech to most existing programs. Due to its remarkable infinite vocabulary, its uses spread throughout the whole spectrum of computer applications — these include educational, industrial, scientific, recreational etc. — simply plugs into the User Port. No ROMs are needed. Smartmouth is supplied with demo and development programs on cassette (easily transferred to disc) and full instructions. **£37(c).**

UV ERASERS

UVT1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59(b).**

UV1 as above but without the timer. **£47(b).**

For Industrail Users, we offer UV140 & UV141 erasers with handling capacity of 14 eproms. UV141 has a built in timer. Both offer full built in safety features UV140 **£61;** UV141 **£79(b).**

'TIME-WARP' REAL-TIME CLOCK CALENDER

A low-cost compact unit that opens up the total range of Real-Time applications, and adds a new dimension to the personal computer. Though built to exacting professional standards, it is at a price previously unattainable, and brings it within reach of all BBC Computer owners. With its full integral battery backup, possibilites include an Electronic Diary, continuous display of 'on-screen' time and date information, automatic document dating, precise timing and control in scientific applications, recreational use in games etc. — its uses are endless and are simply limited by ones imagination. Simply plugs into the User Port — no ROMs needed. Extensive applications software supplied on cassette (easily transferred to disc) and full instruction manual. Please phone for details. **£29(c).**







ACORN IEEE INTERFACE

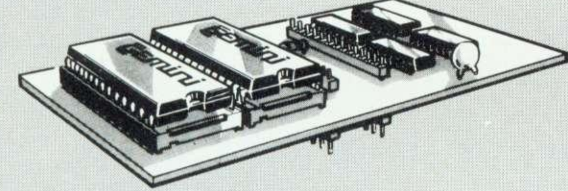
This interface enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 separate IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. £282(a)

ACORN TELETEXT INTERFACE

This interface allows the retrieval and storage of data transmitted by both BBC and IBA. There are currently many educational and other programs being transmitted, and this unit will allow their retrieval absolutely free. In 'Terminal' mode, the system receives and decodes pages from both Ceefax and Oracle. (These pages can be stored). In 'Telesoftware' mode, the system can load, run and execute programs that are transmitted. This unit gives you a professional teletext terminal at a cost effective price. £195(b)

DATABASE MANAGEMENT SYSTEM

GEMINI DATAGEM



The Definitive Random Access, 24K ROM Based DATABASE MANAGEMENT SYSTEM.
Datagem is the first truly flexible database for the BBC Micro that can make your system really useful and efficient, saving you money in the long run. The system includes a carrier board containing two Eproms, demonstration applications disc in both 40/80T, professional documentation with quick reference card, and 'Trans' utility program. Features include: *almost unlimited file size (max 10MByte) *supports up to 4 drives *Max of 5000 records per file *max 6K record size *max of 62 fields *9 level hierarchical search system with facilities to store results of searches. Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference *user defined variables *generates form letters from records. Please ask for leaflet. £112(c).

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Alien Destroyers;	Footer;	Constellation Croaker.
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BBC FIRMWARE

VIEW **Word Processor Rom on special offer at £48(c).**
This is the new version V2.1. Advantages include being able to print straight from memory, as well as editing in any mode. Complete with comprehensive manuals to Acorns usual high standard.

WORDWISE One of the most popular word processors for general use £34(d). Wordwise SpellCheck Disc — A must for any serious word processor user. Normal price £16.50(d). If bought with Wordwise: No p&p and only £14.

ULTRACALC This new version of the successful spreadsheet program has several enhancements to increase its power and flexibility including: * Operation in any mode * Greater printer flexibility incl. control codes £ sign definition * runs as HICALC with 6502 second processor allowing 44K of space in any mode * Spooling as ASCII text files. These features are in addition to the existing powerful features such as handling of labels as well as numbers as values, allowing search by a meaningful name rather than just a number. Facilities and commands include: variable column width, sum, replicate, insert, delete, justify and most mathematical functions. You can create and manipulate pricelists, balance sheets, payroll, c/flow order entry, small databases and scientific calculations. £69(c)

VIEWSHEET Ask for details £52(c)

BCPL A full implementation of the BCPL compiler language from Acornsoft. It consists of the BCPL language ROM and a disc containing the BCPL Compiler, a Screen Editor, a 6502 Assembler, other utilities and program development aids, and some examples of BCPL code. A comprehensive 450 page user guide is included. It can be used to develop games programs and commerical packages, to develop system software, to write control systems, and to produce programs which otherwise would need to be written in assembler. £86(b).
BCPL CALCULATIONS PACKAGE: supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calculation files, example files and a comprehensive user guide. £17.30(b).

UTILITY ROMS

DISC DOCTOR This general purpose ROM adds 20 commands to the DFS system. It includes a formatter, sector editor, tape-disc & disc-tape routines, a powerful disassembler, commands for listing function key definitions for editing etc. This ROM will obliviate the need to go for non standard DFS systems (with their inherent disadvantages) as it overcomes many of the Acorn DFS's shortcomings. £28(d).

GREMLIN Contains a full machine code monitor including features such as a dissassembler, memory move and search routines. Also feature a full expression evaluator and an assembler. Can single step through ROM & RAM as well as any sideways ROM. Works in any mode with full status display. Up to 8 breakpoints can be used and it has a special mode for debugging graphic programs. £28(d).

EXMON This extended machine code editor provides 35 new commands. Features include machine code relocator, single stepping, memory search and full assembler & dissassembler. £20(d).

TOOLKIT This ROM adds 27 new commands to the BBC BASIC. These include a full screen editor, merge, relocating data in memory, program compactor, listing of variables and memory search. £23(d).

CARETAKER This adds 17 new commands to the BASIC which include: renumber, squash, exchange insert, single key entry of BASIC keywords etc. £28(d).

GRAPHICS ROM This ROM includes over 28 new graphics related commands which can be used in BASIC programs. Features include: sprites, LOGO Turtle graphics, fill routines, shading, large characters, rotation, scaling and 3D plotting all using '*' commands. £28(d).

PRINTMASTER This ROM features the most versatile screen dump for EPSON MX/RX/FX80 and Kaga 810 printers. It supports three types of dumps. The first allows any graphics on the screen to be dumped. Colours appear as shades of grey. Any part of the screen can be printed at any position on the paper in any one of four orientations. The screen dump may be magnified by any factor ×2, ×3, ×4 etc. A special feature allows true MODE 7 screen dumps with TELETEXT text & graphics. The second dump allows any text to be dumped whilst the third dump will print the contents of a file on disc whilst the computer is doing other things. This is not all. All printer functions can be called up using the *command. *DEFINE allows the user to define his own characters and store them. *GPRINT allows printing of enlarged text in any position, orientation, size & shade. *WINDOW allows windows to be defined in any size and position on the screen. **In short this one ROM does it all.** £28(d).

SOFTWARE

CP/M SOFTWARE FOR TORCH Z80 ACORN Z80 PROCESSOR

We can now supply almost any CP/M based software package in a format suitable for the Torch Z80 and Acorn Z80 second processors. The following are generally available from stock.

DBASE II £365 (a) WORDSTAR £295 (a) MAILMERGE £145 (a)

WORDSTAR/MAILMERGE COMBINED £395 (a)

DBASE II TUTORIAL (All Lessons on Disc) £32 (c)

PROPASCAL £220(a) CP/M TUTOR £55(c)

Phone for your specific requirements.

Please specify the type of format (TORCH or ACORN) required.

MICROTEXT

This authoring system was developed by the National Physical Laboratories. It is a programming system designed to simplify the production of a wide range of man-computer dialogues. Using Microtext's simple commands, the user can draw up any number of 'frames', each containing text and/or graphics. A series of frames build up into a complete module. Each program can consist of more than one module. Using Microtext, an expert in any field can construct their own complete courses of computer-based instructional material. Applications include interviewing systems, teaching packages, training courses and interactive demonstrations and simulations. Available on Cassette and Disc; **Disc** £53(b); **Cass** £43(b). Please specify the type of format required (Torch or Acorn).

ACORNSOFT (d)	Disc	Cass		Cass
S-PASCAL	£17.30	£14.65	MISSILE BASE	£5.00
LISP	£17.30	£14.65	PLANETOIDS	£5.00
FORTH	£17.30	£14.65	METEORS	£5.00
PICTURE MAKER	£10.00	£8.65	CAROUSEL	£5.00
TURTLE GRAPHICS	£17.30	—	MONSTERS	£5.00
CREATIVE GRAPHICS	—	£8.65	FORECAST	£5.00
HOPPER	£6.00	—	CHESS	£5.00
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STARSHIP COMMAND	£6.00	—	**BBC PUBLICATIONS**	
JCB DIGGER	£6.00	£5.00	VU TYPE	£11.65
AVIATOR	£15.65	£13.00	RECORD KEEPER	£14.00
CRAZY TRACER	£6.00	£5.00		
ELITE	£15.65	£13.00		

Elite Cassette & Disc versions available from stock. (Disc version for 40TSS or 80TDS).

Replica II 40 & 80 Track Versions available. £10.35(d)

Printer Drivers On disc 40 or 80 Track Disc RX/FX80/KAGA/NEC PC8023/JUKI 6100/BROTHER HR15 £7(d).

Design Design is a second processor which allows information to be displayed in a format suitable for demonstrations, slide projections, handouts or presentations. Graphs, Pie charts & Bar Charts are quickly produced; automatically drawn & scaled. Versatile labelling facility, 24 User defined, 4 large macro characters plus screen dump facilities included. £16.50(d) Disc (80 or 40 Track).

Superplot Superplot is ideal for screen representations of mathematical functions. It will plot on automatically scaled axes, in Cartesian, Polar or Parametric co-ordinate systems and will allow overlapping of graphs. **Cass** £8.50(d).

Spellcheck Menu driven spelling checker for Wordwise or VIEW. Dictionary contains 6000 words and is expandable to 17000 on 100K disc. £16.50(d) Disc (80 or 40 Track) Specify whether Wordwise or VIEW.

Masterfile A general purpose data base that is extremely useful, allowing vast amounts of information to be stored. The disc version allows up to 17 fields per record, and the only limitation as to the number of records is the capacity of the disc. Typically, using 5 fields, *about 2000 records may be stored on a 100K disc.* ***£16.50(d) Disc.***

Teletext Pack *An editor enabling colourful mode 7 screens to be* quickly ceated. Powerful facilities including a graphics character definer, speed up screen creation and design. Screens can be loaded or saved in the normal way or specially saved as a Basic routine for use in other programs. On screen teletext tutor included in the package. Ideal for setting up prestel type displays £16.50(d) Disc (80 or 40T).

When ordering software on disc plese specify track format (40/80)

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Words Words Words A stimulating game to help young children with reading & spelling. Pictures are shown on the screen and the child has to type in the name of the object shown. If correct, the object takes its place in a scene. When all objects have been correctly identified the scene comes to life. £7(d).

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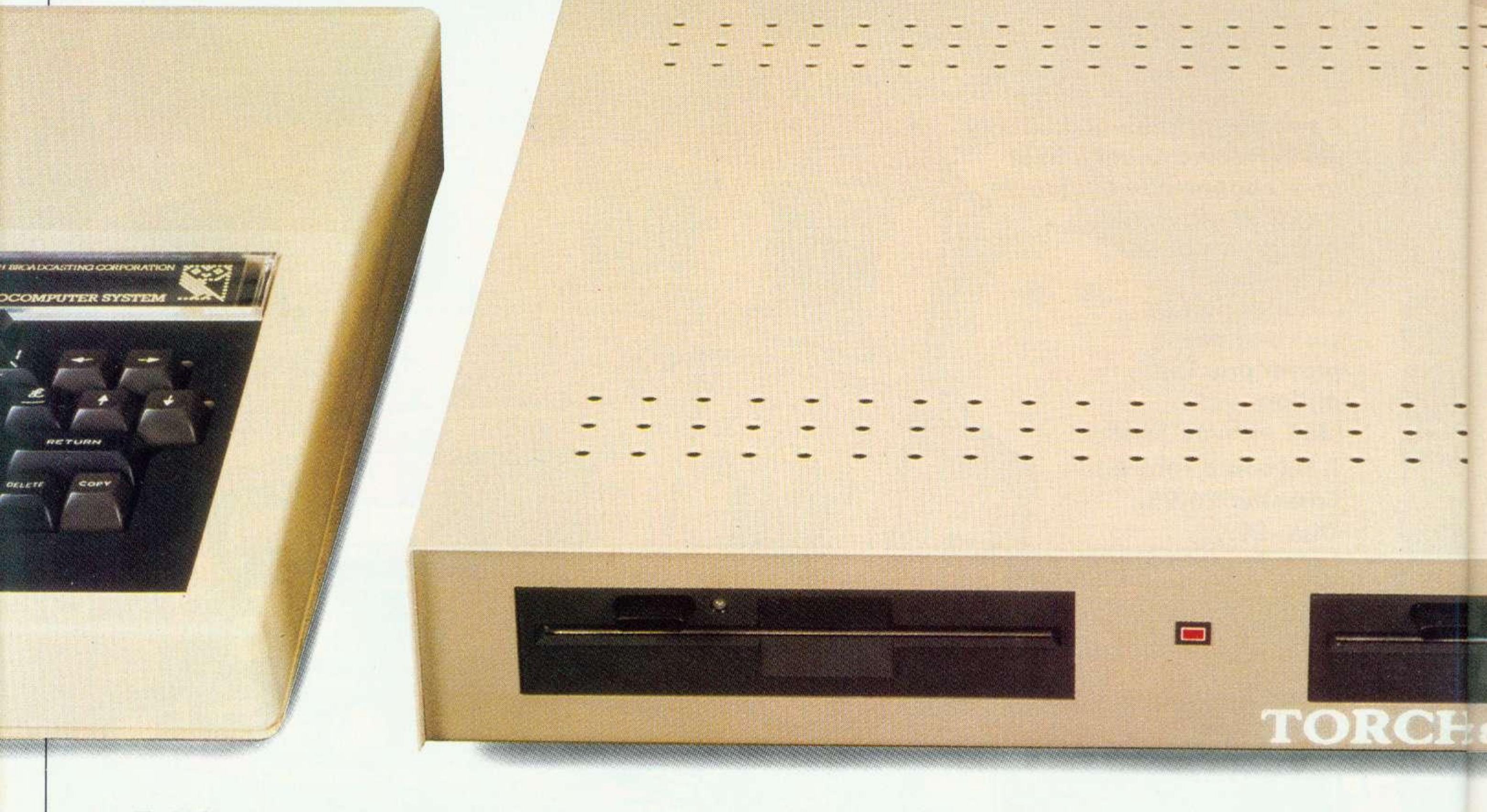
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The best thing next



The BBC Model B Microcomputer is widely recognised as an impressive first computer for the home or the school, but its capabilities are restricted by its lack of data storage and the limitations of Basic for serious programming. For the user who needs more from this computer the Torch Z80 Disc Pack is a gateway to the world of advanced computing.

Model B's fitted with disc interface can be upgraded to full business machines by the Torch Z80 Disc Pack thereby offering the use of more powerful and flexible languages such as Fortran, Pascal, BCPL and Cobol while twin 400K disc drives provide a massive storehouse for information and rapid data transfer from disc to processor.

Torch Z80 Disc Pack
The Torch Z80 Disc Pack is the proven upgrade for the BBC Model B microcomputer. It provides 800K of disc storage plus a Z80 second processor with 64K RAM running TORCH's own CP/M® compatible operating system based in ROM.

This advanced design means that almost all of the 64K RAM provided by the Z80 board is available for programming use – an advantage no other BBC micro upgrade can offer.

If your BBC micro has the Econet® option, there is a further benefit the Torch Z80 Disc Pack can offer. TORCHNET can link together up to 254 upgraded Model B's on a local area network, so for enthusiasts, clubs, schools and businesses it is a simple and low-cost way to achieve networking facilities.

The discs can be used for storage under the Acorn DFS system or for CP/M® programs and data.

A comprehensive software package is provided which includes word and data processing and a spreadsheet program, along with utility programs and manuals.

The Torch Z80 Disc Pack is recommended by the CCTA for government use.

At £699 the Torch Z80 Disc Pack is exceptionally good value.

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When fitted to a BBC system which already has compatible high quality twin 400K disc drives, the ZEP100 provides a complete business or scientific computer.

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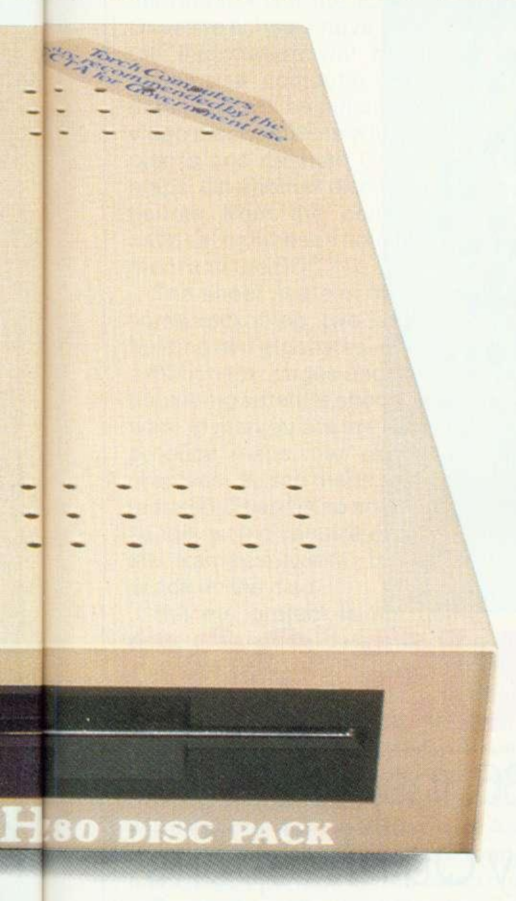
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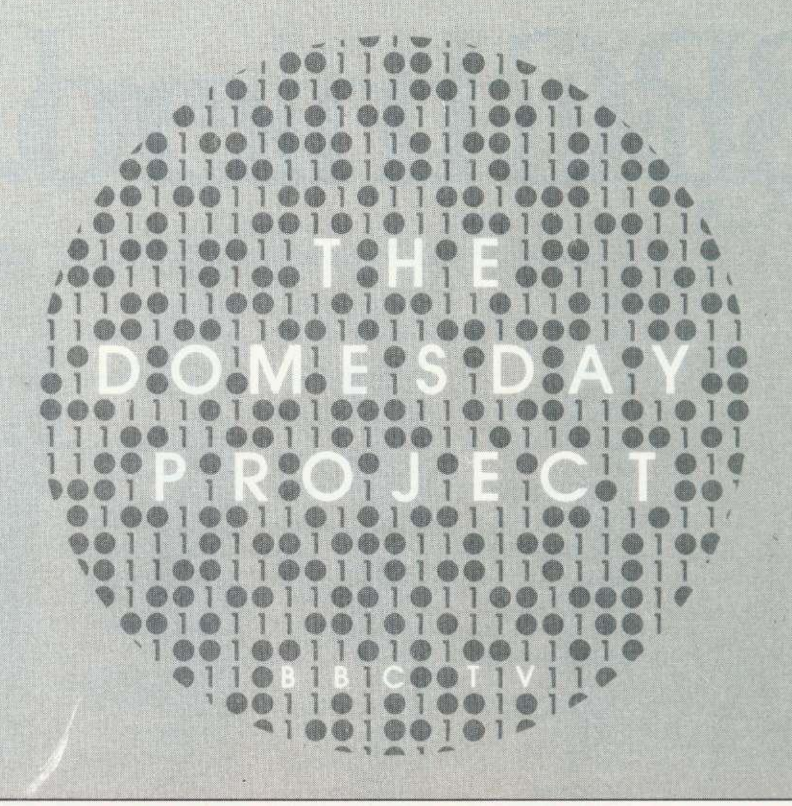
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DOMESDAY PLUS 900

William I's great survey, completed in 1086, inspires a massive project nine centuries later. Tony Quinn reports

THE BBC is to give the British people the chance to write a modern, video disc version of William the Conqueror's Domesday Book to celebrate its 900th anniversary in 1986 – with the help of BBC micros in schools. The resources and expertise of several of the Corporation's departments and the Open University are to be used, and schools will be offered the chance to collate the information.

But Peter Armstrong, Editor of the Domesday Project and the man who thought of the idea, stresses that he wants to involve everyone. 'We hope to mobilise communities. Everyone will have the chance to contribute something,' he says, 'with the schools acting as a focus and providing the computer.' Parents and local societies can help collect data and then there are 80,000 pictures to be taken for the disc.

The BBC will be writing to all 30,000 schools in Britain to ask them whether they want to participate in collecting facts during the summer term next year. It is estimated that 10,000 schools will be needed to make the scheme work, which would involve about a million children. A similar project was undertaken in the 1950s by Dudley Stamp, and it is estimated that it took him 16 years: the BBC, with the aid of computers, aims to do more in just two.

To those schools which decide to participate the BBC will allocate a local area 12 kilometres square based on Ordnance Survey maps. With the maps will come a set of discs containing a database questionnaire asking about the geography, amenities and land use in the area. As well as this, they will be asked to write about the area in their own words. Armstrong stresses that they will be able to add anything and comment on the issues affecting them, as long as it is publishable!

WHAT IS INTERACTIVE VIDEO?

THE technology that Philips is developing with the BBC is based around the video laster disc player. In this system, the video information, until recently just TV pictures, is recorded on a disc similar to a gramophone record. This is then coated in a very tough see-through plastic which means the disc can be marked or scratched without affecting its ability to be played. The disc is read in the player by a laser beam and contains about 30 minutes' worth of TV programmes.

As well as TV pictures, the disc can store still pictures, computer graphics, text, maps and computer data. When the information is stored so that it can be read by a computer, it can be manipulated by software on the video disc (or another program), and still or moving pictures can be overlaid with graphics – hence the term 'interactive'. Information can only be read from the disc and not written to it. It can act as a read-only floppy disc because it has random access capabilities – the laser head can read from any part of the video disc, just as a hi-fi stylus can play any selected piece of music on a record. However, the access time is slower than that of a normal disc drive.

What makes the system different is the way the information is stored: it is not digital, but in a semi-analogue form.

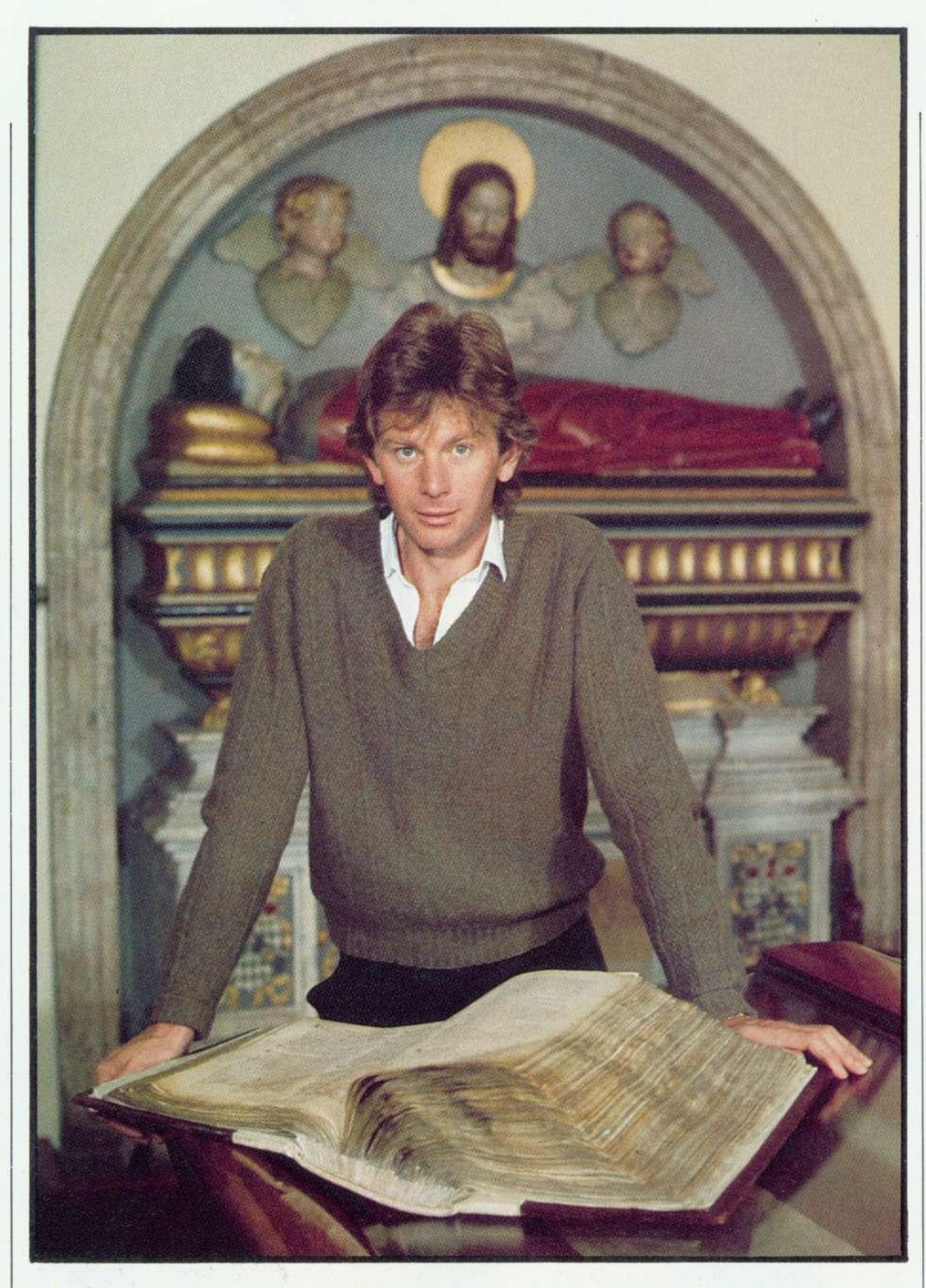
'Interactive Video: Implications for Education and Training' is the title of a working paper by John Duke which was published in 1983 by the Council for Educational Technology.

The school will be the centre of the project, as only by computerising the information will the idea be practical. Once the schools have sent in the discs the information will be stored on a mainframe computer. This 'people's database' will be put on one interactive video disc complete with pictures of the places and detailed Ordnance Survey maps. On another disc will be facts and figures from the census and other national databases held by the Government and the BBC.

The sheer scale of the project takes some reckoning: two laser discs each holding two gigabytes – enough for half a million text pages and 80,000 pictures (including satellite shots), plus the software to manipulate the information and produce maps, bar charts and other graphics. All the maps and data will be indexed. There is no sound on the discs as this would require moving pictures; still frames make far better use of the space on the disc.

But the project is not going to be merely a unique data-gathering exercise: the BBC and Philips, who will be producing the video disc hardware, aim to establish a world standard for laser discs. The hardware will run on other micros, although the actual Domesday (Doomsday) disc software will be written for the BBC micro. Acorn is writing the software and building the final stage interface for the video disc.

Domesday should help the laser technology overcome the 'chicken and egg' situation whereby the hardware won't sell because there's no software, and no-one will write any software because there aren't enough people with the hardware to run it. The BBC's project, involving the Department of Trade and Industry, Philips and Acorn, will not just create the technology; it will demonstrate its potential and show how it can be used. Elsewhere within the BBC, producers are talking about selling TV programmes on video disc.



Historian Michael Wood, who in 1986 will present a major TV documentary series on Britain since the Conquest when the video disc Domesday is launched, leafs through the original version. In preparation for the series the Domesday Book of 1086, in the National Archive, will be withdrawn from public access to undergo cleaning and restoration

The Domesday disc truly is, as Armstrong describes it, 'a portrait in data and pictures of Britain and the British, containing twice as much information as a complete set of the *Encyclopaedia Britannica*.

Armstrong came up with the idea in May and presented it to the BBC in September – the go-ahead was given only at the end of October. When the video discs and hardware are released in 1986, they will be accompanied by a major TV documentary series following the development of Britain from the Domesday Book to its laser-disc successor. The presenter will be historian Michael Wood, recently seen on the BBC's *River Journey* series.

A special editorial board of academics has been set up to decide exactly what should go on the discs, how the questions will be asked and how the information should be presented. The variety of information to choose from is enormous – everything from tree counts to folk music – and the board's members will have to narrow it down. The data will be held on a form on the discs so that it can be accessed by other software and used in educational and other programs.

The project is the biggest the BBC has ever undertaken, costing some £2 million and employing about 50 people just to produce the discs. It is a bold idea which Peter Armstrong believes only Britain, with its network of BBC micros in schools, could do and that only the resources of the BBC itself could support. 'The idea sold itself fairly quickly,' says Armstrong, 'as we realised the tremendous educational opportunity it presented.' It will also demonstrate the possibilities of a technology that many people in the BBC believe will revolutionise education, he adds.

It is seen as an ideal follow-up to the Computer Literacy Project. John Radcliffe, who started the project and has now moved on to the Open University, is heavily committed to Domesday and will be co-ordinating the OU's involvement.'

After updating the Domesday Book once, will the BBC do it again and update the video in, say, 20 years? Armstrong wants to get this one out of the way first. He says: 'There is a temptation to update, but we don't know.'

Watford Electronics





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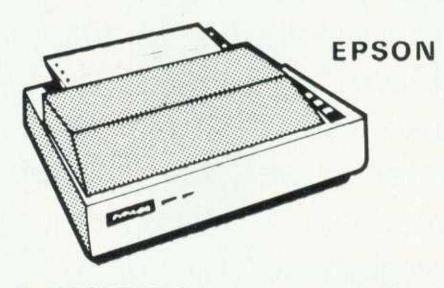
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BROTHER HR-15

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Carriage on Printer Paper or Labels £1.50

Carriage on 1,000 Labels £1.00

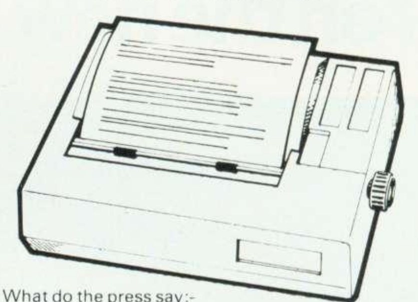
All prices exclude VAT

NEW 4 COLOUR PLOTTER PRINTER

How often have you wished you had a colour plotter for your computer, but have been put off by their high cost? Well, Watford Electronics can now supply you with a high quality, low cost plotter with Centronics interface. The SCP-800 printer/plotter facilitates plotting and printing in four colours on paper up to A4 size, using easily replaced pens. It can operate in a text mode, performing like an ordinary printer capable of speeds up to 12 CPS with a maximum of 160 characters per line on A4 paper. In graphics mode it offers full plotting facilities including drawing, moving, scaling of text, rotation and drawing of axes.

At an incredible low price of:
Only £179 (£5 carr.)

KAGA KP810



What do the press say:-
"At £269 this is an unbeatable product for what it has to offer." – Educational Computing.
"Offers excellent value for money." – Electronics & Computing.

This new Japanese printer has EPSON FX/RX compatible control codes and is functionally equivalent to an FX80 with the added advantage of its 'Near Letter Quality' mode. It is solidly built and features include: Normal, Italic, Enlarged, super/subscript, proportional spacing and user-defined character set. Extras over the FX80 included in the price are Near Letter Quality (NLQ) print ideal for correspondence, properadjustible tractor feed, half speed quiet mode and 3K buffer. The printer is bi-directional and logic seeking to give a speed of 140CPS for high throughput in conjunction with the standard 3K buffer. 8K RAM may be added to give more user-defined character sets. Centronics parallel interface + Watford's 12 month NO QUIBBLE WARRANTY.

Special Offer: ONLY **£239** (£7 carr.)

RS232 interface + 2K buffer to connect to other micros **£89**

KAGA KP910 PRINTER

Very similar to the KP810 but with 17" carriage for really wide print. Gives 156 columns of normal print or 256 columns in condensed mode. This printer is ideal for printing out spreadsheets and can also be used for correspondence in NLQ mode.

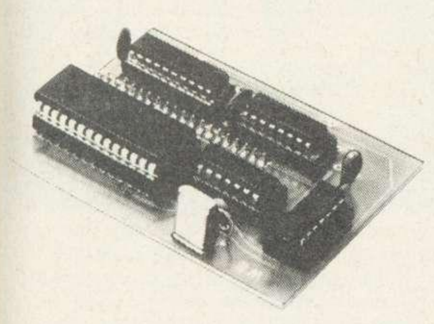
ONLY **£339** (£7 carr.)

PRINTER LEAD 36"

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

STANDARD (3 foot long)	**£7**
EXTRA LONG (5 foot long)	**£10**

DOUBLE DENSITY DISC INTERFACE



SIMPLE but SOPHISTICATED

We are proud to announce the launch of the Watford Electronics Double Density Board for the BBC micro. The DDFS supplied is a new version of the popular Watford Electronics DFS re-written to make full use of the capabilities of the new double density controller.

- Increases storage capacity of your Disc Drives by the maximum physically possible, 80% !!!
- Our system will use the whole of an 80 track drive. Inferior systems do not allow files longer than &3FFFF bytes, but with our system files can be as long as one disc side.
- Discs may be created in either single or double density format with the built in formatter and in single density mode are fully compatible with normal Acorn format discs.
- The density of the disc you put in is automatically sensed by the system and you are informed of the density in the catalogue display.
- The double density system is of course faster than single density.

The Watford Electronics DDFS implements an extremely comprehensive 8271 emulator so that commands passed through OSWORD & 7F are correctly interpreted. Other manufacturers thought that read and write sector alone were sufficient – we decided to implement every command of the 8271 that was physically possible. We have allowed the use of all the special registers including bad tracks, allowed access to deleted data etc., etc. The emulator itself takes up around 1K of compactly written machine code. We reckon it will run many of the protected discs now available. Gain all the advantages of the WE DFS together with much increased storage and compatibility with many existing protected discs. The price is the same as for the standard single density system that we continue to sell so you can choose between the two options without financial worries.

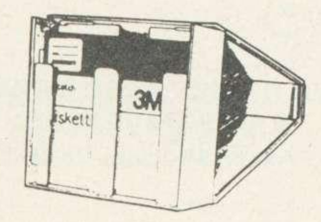
Complete Unit incl. DDFS ROM **£85**
DDFS Manual **£6.95** (no VAT)
We will exchange your existing Single Density Interface for our DDFS Unit for **£55**
(Carriage £1.50)

* SPECIAL OFFER *

EPROMs for BBC Micro (Hitachi)
2764-250nS **£4.75**
27128-250nS **£16.00**

RAMs for BBC Micro (Hitachi)
6116L (2K) **£3.75**
6264L (8K) **£24.00**

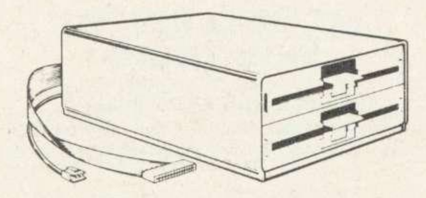
NEW DESIGN PLASTIC LIBRARY CASES



for Disc Storage 5¼" (holds 10) **£1.80**

DISC DRIVE PRICES SLASHED!

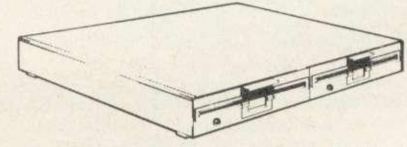
(NEW SLIM-LINE DRIVES)



(DRIVES Cased with Cables; connects directly to your BBC Micro)

- **CLS 100** Single, TEC Single sided 40 track 100K, 5¼" Disc Drive **£97**
- **CLS200** Single Drive, Double sided 40 track, 200K, 5¼" **£129**
- **CLS400** Single, Mitsubishi Double sided 80 track 400K, 5¼" Disc Drive **£135**
- **CLS400S** Single, Mitsubishi Double sided 40/80 track Switchable, 400K, 5¼" Disc Drive **£152**
- **CLD200** TEC Single sided 40 track 200K, twin 5¼" Drives **£199**
- **CLD800** Mitsubishi Double sided 80 track 800K, 5¼" TWIN Drives **£269**
- **CLD800S** Mitsubishi Double sided 40/80 track switchable, 800K, Drives **£299**

(CUMANA) DRIVES CASED WITH PSU & CABLES



- **CS100** TEC Single sided 40 track 100K 5¼" Single Disc Drive **£119**
- **CS200** TEC Single sided 80 track 200K 5¼" Single Disc Drive **£149**
- **CS400** Mitsubishi Double sided 80 track 400K 5¼" Single Drive **£169**
- **CD200** TEC Single sided 40 track 200K 5¼" TWIN Disc Drives **£236**
- **CD400** EPSON Double sided 40 track 400K 5¼" TWIN Disc Drives **£299**
- **CD800** Mitsubishi Double sided 80 track 800K 5¼" TWIN Drives **£349**
- **CD800S** Mitsubishi Double sided 40/80 track Switchable 800K TWIN Drives **£399**
- SPARE DRIVE CABLES, SINGLE **£6;** DUAL **£8**
- DFS Manual (comprehensive) **£7.50** (No VAT)

P.S.
You do not require a formatting disc nor the expensive 40/80 track switchable drives if you use Watford's sophisticated Disc Filing System which has all these facilities in the ROM.

(Carriage on Disc Drives £7 securicor)

DUST COVERS

(For our Disc Drives)

Single (without PSU)	£3.20
Twin (without PSU)	£3.85
Single (with PSU)	£3.25
Twin (with PSU)	£3.90
Twin (side by side with PSU)	£3.95

5¼" DISKETTES

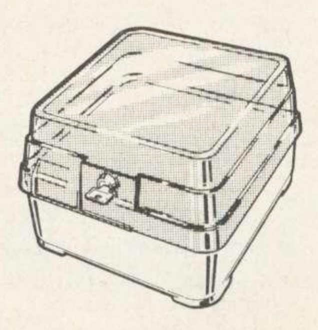
Top quality 3M and XIDEX diskettes with a lifetime guarantee. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied with disk labels and write protect tabs.

- 10 SCOTCH / 3M + labels S/S S/D **£14**
- 10 SCOTCH / 3M + labels S/S D/D **£15**
- 10 SCOTCH / 3M + labels D/S D/D **£22**
- 10 XIDEX + labels S/S D/D **£15**
- 10 XIDEX + labels D/S D/D **£24**

DISC ALBUMS

Atractively finished in beige leather-look vinyl, these conveniently store up to 20 discs. Each disc can easily be seen through the clear view pockets.
£4.25

LOCKABLE DISK STORAGE UNITS



Strong plastic cases that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

M35 holds upto 40 discs **£13**
M85 holds upto 95 discs **£17**

FLOPPY HEAD CLEANER KIT

The heads in a floppy disc drive are precision made and very sensitive to dirt. Drive manufacturers recommend that you clean the heads approximately once a week. Unless your home or office is dust free one of these kits is a very sensible precaution against losing valuable data. A dirty head can destroy many disks before you realise the trouble. Very simple to use.
Only **£14**

BBC MICRO WORD-PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in for a demonstration.

EXAMPLE PACKAGE
BBC Model B, Watford Electronics' DFS upgrade, WORDWISE ROM, Twin 200k Teac drives in beige, Zenith 12" Hi-resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 × 3M discs, 500 sheets fan-fold paper, 4 way mains trailing socket, manuals, all leads and BBC carrying case.

ONLY 3 **£1,125** (£15 carr.)



ACCESS HOT LINE (0923 50234).
24 Hours

Continued



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop.

MICROVITEC

- 1431 – Medium resolution as used on the BBC television computer programme ... **£165**
- 1451 – High resolution, suitable for word processing in mode 0 ... **£255**
- 1441 – Super High res. exceeds the capabilities of the BBC micro ... **£385**
- Dust Cover for Microvitecs ... **£5.50**

All Microvitec monitors are 14" RGB in their distinctive right angled case. They come with the connecting lead to the BBC and a mains plug.

KAGA

- Standard resolution with RGB and composite video inputs ... **£195**
- High resolution colour ... **£259**
- KAGA III Super High resolution ... **£349**

Kaga Monitors are 12" RGB colour units housed in an attractive beige plastic cabinet. They all have as standard, a genuine etched anti-glare screen.

ZENITH

12" Ultra high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. The high resolution makes it good for games too – you can really see the detail that has been put into the graphics. ... ONLY **£68**

LEADS

BNC Lead for Zenith or Philips ... **£3**
BNC for Zenith ... **£3**
RGB lead for KAGA ... **£5**

N.B. Carriage on Monitors **£7** (securicor)

Versatile **BEEB SPEECH SYNTHESISER** Unit



SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!
PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!
BUILT-in Library of approximately 500 words to get you started.
ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.
EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!
COMPACT unit – The whole system is built into a small case – easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.
HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

SPECIAL OFFER £35

Best cost less at WATFORD

WATFORD'S LAUNCH OF THE YEAR

APEX

The ultimate expansion system for the BBC microcomputer. It enables you to increase memory capacity to 2+ MEGABYTES including BATTERY BACKED-UP RAM.

The system consists of a mother board which fits inside the BBC and further daughter cards can be connected externally. The internal card has the following features:

- 15 ROM/RAM sockets, 11 of which can be configured as 2716, 2732, 2764, 27128 EPROMS or ROM equivalent devices or as 6264 RAMs. Any RAM is Automatically battery backed-up and it's contents preserved when the power is turned off.
- The battery is recharged every time the machine is turned on and lasts several months, depending on the number of RAMs fitted.
- There is very little extra current drain, even with a fully loaded board as only the presently active ROM is powered up. In fact the fully populated board uses only 300mA.
- The board reduces micro bus loading by up to three ROM loads, which improves reliability and performance.
- Installation is extremely simple. There is no soldering required. The board is rigidly held by two 40 pin sockets and five support posts. A ribbon cable can be brought outside the computer and up to 8 external cards added. This enables the user to plug-in up to 142 paged ROMs. The cards have following features:

- Each card can accommodate up to 16 devices each of which can be configured as 2716, 2732, 2764, 27128 ROMs or 6264 8K RAMs.
- Battery backup is provided from the internal card.
- Only the active ROM is powered up permitting many external ROMs to be added with very little current loading (100mA per card).

The system comes with controlling software in ROM. The utilities supplied are as follows:

★ APEX – replies with the device number currently being accessed.

★ APEX C – toggles between the colour and standard black and white messages.

★ AL – loads from any device, regardless of the data type.

★ AS – saves memory to any specified RAM device.

★ AD – prints a directory of the devices present in the system, i.e. ROMs present and files stored. This also reports on the amount of free storage space.

★ AF – asks for the free RAM devices.

★ LA – repeats the last command to paged ROMs.

Continued

★ AT – enters a memory testing routine. This will write a test pattern into the memory and read it back out again. If a fault is found, it is reported to the user. This test continues until Escape is pressed.

● RDISC – activates APEX as a filing system which then treats all free APEX RAM in the system as a continuous 'RAM-DISC'. All commands have similar format to the DFS and transfer is possible between the two systems.

The complete computer system bus is available to the user, so that other cards/devices could be added such as EPROM programmers, second processors, Winchester disc drives, clocks, etc. By racking the cards you eliminate the tangled mass of cables that usually accumulates around the micro.
A comprehensive operating manual is supplied with every APEX Board. Please write in for further details and prices.

THE ULTIMATE DFS FOR BBC MICRO

by

Watford Electronics

Highly acclaimed at The ACORN and BBC MICRO USER Shows. What do the independent press say?

Good value for money – *Beebug Aug. '83*
A very worthwhile package – *The Micro User*

You'll be buying a very powerful package – *Personal Computer News*

Superior DFS: Excellent disc sector editor – *Computer Answers*

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

Please write in for full technical specification.

PRICES:
DFS (Disc Filing System) ROM **£25**

Complete Disc Interface Kit including DFS ROM & Fitting instructions P.O.A.

Disc Filing System Manual. Comprehensive and clearly written £7.50 (no VAT)

P.S. We will exchange your existing ACORN DFS or PACE (AMCOM) DFS for Watford's highly sophisticated 16K DFS ROM for **£19**

Watford's DFS is exclusively available from Watford Electronics. We do NOT retail through any dealers. Every ROM carries a label with our LOGO and a serial number.

Now available:
Acorn DFS Kit ... **£99**



MYSTRIES OF DISC DRIVES & DFS REVEALED

Price: **£5.95** (Book – No VAT)

BEEB PRINTER ROM



This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:
★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.
★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.
★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.
★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.
★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.
★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting facilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any Mode (including Mode 8). There are various optional parameters but you need only specify the parameters you wish to change.
● V <scale>, H <scale> – These 2 byte numers give fine control over the size of the dump from minute to enormous. Unlike other dump ROMs the scale does not change with mode.
● R <0-3> – Print dump rotated by 0.90, 180, 270 degrees.
● I <indent> – Set gap from left edge of paper.
● X <min>,<max>, Y <min>,<max> – The whole of the screen graphics window area is dumped except when these parameters are given.
● P – Physical colour values are used for plotting, otherwise a negative scale is used (white darkest).
● T Two tone dump for maximum resolution.
● M <mask> – 8 bit colour mask.
● E – Contrast expansion to make mode 7 text and separated graphics stand out from the background.
● C – All mode 7 graphics are printed as contiguous to improve the shading in graphic areas.
*TIMAGE <indent> – Does a fast, text only, dump of the contents of the text window in any mode.
*GWINDOW and *TWINDOW – These commands draw the graphics and text windows, respectively, on the screen and allow them to be changed with the cursor keys. N.B. GIMAGE and GWINDOW work fully in mode 7.
Designed for use with the following printers: CP80, GP80, GP100, GP250, STAR, KAGA/TAXAN, NEC, SHINWA, GEMINI, EPSON MX/RX/FX,LPVII, DMP 100/120/200/400, CANON.

Price including comprehensive manual **£22**

EPSON DUMP ROM

This screen dump ROM is specifically designed for use with the Epson RX/FX printers and the Kaga KP810. It is extremely simple to use as there is only one command to remember. It will accurately dump any screen mode using multiple tones as required. Mode 7 is fully supported giving teletext graphics, double height etc. For those who like to keep life simple this EPROM is only **£20.**

NEW LAUNCH

EPSON FX/RX LETTER QUALITY PRINT ROM

Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ !Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
● Simply type *NLQ80/100 and a single VDU code to use NLQ print.
● NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
● Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
● Full UK character set.

Standard 'pica size'
Proportional spacing
Enlarged
Underlined
Normal type

The NLQ ROM is incredibly easy to fit and use. Supplied complete with Manual.

Only: £20

NEW RELEASE

THE EPSON FX/ KAGA PRINTER COMMANDS REVEALED

for the BBC Microcomputer
(The only Printer Book for the Epson FX-80 compatible printers).

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'The EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

This book is superb value at only **£5.95** (Book – No VAT)

FORTH ROM for BBC

This ROM provides a complete implementation of the FIG-FORTH standard (including editor). Supplied with a large tutorial manual at only **£33**

TINY PASCAL for BBC Micro £59

ULTRACALC

A very sophisticated ROM based spreadsheet (upgraded version) from BBC Publications. The new ROM has more power and flexibility.
Features:
● Operation in any screen mode.
● Greater printer flexibility incl. control codes & £ sign definition.
● Runs as 'HICALC' on a 6502 second processor to allow 44K of workspace in any screen mode.
● Spooling of ASCII text files for subsequent use with any word processor.
● Several additional layout options.

Price **£65**

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc. . . **£46**

HIGHVIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEWSHEET (Acornsoft) **£49**

NEW RELEASE

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS

Watford Electronics are now able to supply a new View Driver package to complement any View wordprocessor system using the Brother HR15 and Juki 6100 daisywheel printers.

The facilities offered by this driver are:
● Auto Underlining
● Bold
● Shadow
● Superscript
● Subscript
● Proportional spacing
● Pad character facility

The program is supplied on a 40/80 track disc with full instructions for its use.

Only £9

FX80 PRINTER DRIVER

Watford's own Sophisticated VIEW Printer Driver for FX80

To simplify using the full facilities of the Epson FX80 or Kaga KP810 use this printer driver. Full facilities are provided for selecting between fonts etc. The disc includes examples of use and instructions. Available on 40 or 80 track disc (please state which required). **£6**

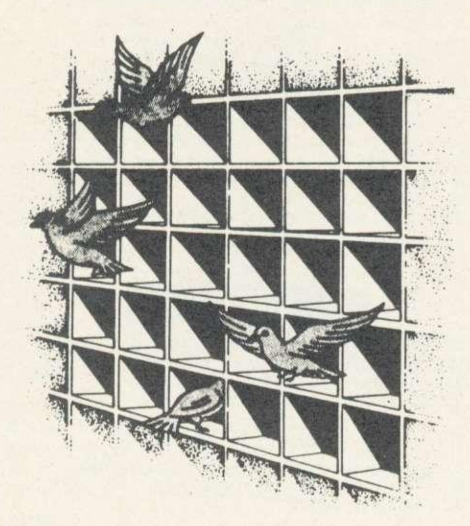
VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of Printers and Typewriters. The View driver allows access to all of the features supported by the range of daisy wheel printers (EXP 770/400/500/550). These include underlining, bold, shadow, superscript, and subscript printing. Additionally, you can use proportional spacing on the EXP 770. Owners of one of the typewriters in the range EX 55/44/43, using it as a printer, can also access underlining with these drivers.
The printer drivers also extend the facilities in View to allow the use of pad characters.
The printer driver on disk with a user manual is at a special introductory price of **£7.**
Please specify printer type when ordering.

Continued

TWO DATABASE MANAGEMENT SYSTEMS



DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.
Despite the ease of use this system provides all the facilities needed for complex data handling problems. The length of database that can be handled is only limited by the total space on the disc. You can have up to 20 fields with page length records up to 254 bytes in length. Adding and deleting records, amend titles, field names and records. Sort on any field and search for any record or group of records in any field. The database may be re-formatted after creation, the system will re-write all your files for you automatically. You may add extra fields and extend the length of existing fields freely.
Output formatting is very powerful. You are allowed 40, 80 or 132 column output modes going to printer or screen. Selected fields can be put in any order on the screen or printer, either across the paper or down. Output can start or stop anywhere in the file. Decimal fields are automatically totalled and records output are counted. Version 2, now on sale has improved input and amendments procedures giving full record edit as well as the 3 extra features . . . String searching, Calculations on numeric fields, and the ability to create sub files from your main files.

On disc at **Only £17**

(Please specify 40 or 80 track when ordering)

FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer.
File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.
The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.

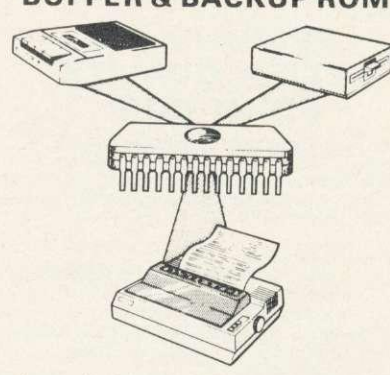
Cont.

Operations supported are −, +, *, /, +−999999 9999.9999 and compare facilities =, >,<>,<=, >=, <, &,.
Many keywords are supported by the language: assign, compare, display, end, goto, iff, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

Only £43

(Please specify 40 or 80 tracks for the utilities disc)

BUFFER & BACKUP ROM



For those with sideways RAM fitted in their machines this utility ROM will make full use of this facility. By using the sideways RAM area for extra memory the following features are implemented:

★ 4K or 16K buffer for parallel printer.
★ Dumps selection of Disc files to Tape.
★ Makes backup copies of tapes on to tape and disc.
★ Displays contents of paged ROMs on screen.
★ Menu display of ROM filing system contents on Shift-Break.
★ Comprehensive manual.

Only £22

DATAGEM

Gemini's 24K ROM based DATABASE Management System
Special Introductory Offer: **£99**

PEN PAL—VERSATILE LIGHT PEN SOFTWARE

Do you have a light pen that never gets used? Then this piece of software is for you. This package offers many useful facilities that make the light pen a useful device to own. Facilities included are:

- Pixel, Line and Character definition
- Free hand drawing
- All Colours
- Fill, Refill and stripes
- User defined "Brush strokes" plus character definer
- Grid, Scale and perspective aids 2 to 200 points palletable in one design with Circles and "rubber banding"
- Move design/character to any screen position
- Save and Load screens, User defined characters and line drawings for video titles, own programmes etc.

This program has many uses in education and at home. It is supplied with a comprehensive instruction manual.
Works with Watford, RH, Acorn User, DIY and many other Light Pens.
Prices

TAPE	**£10**
DISC (40 or 80)	**£11**

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your cassette programs to disc. If you have difficulties transferring your cassette software to your disc system then this is the answer. It handles 'locked' files and full length adventures (up to &&e blocks) and programs that load below &E00. It is very simple to operate with instructions supplied. It saves you time and money.

Price **£10**

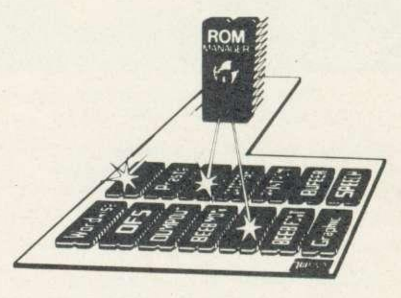
(Please specify 40 or 80 track discs)

ADE

Complete program development package in a 16K ROM. Full assembling and debugging facilities provided.

SPECIAL OFFER ONLY **£43**

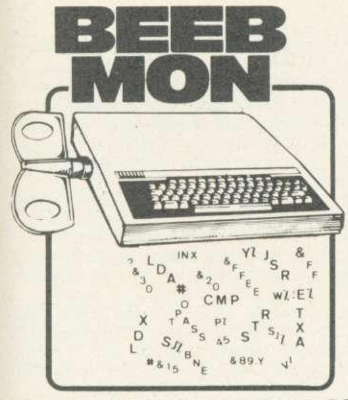
ROM MANAGER



This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.
The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

The commands given in the ROM:
• CHECKSUM – Generates a CRC for a specified ROM (useful for testing suspected faulty ROMs).
***DIRECT** – Passes a command directly to a named ROM (overcomes command name clashes).
***EXAMINE** – Allows examination of a named ROM
***EXPLAIN** – Gives detailed explanation of the first 22 *FX codes.
***FILE** – Passes a command directly to the current filing system (which normally receives commands after all the ROMs).
***FUNCTION** – Lists the contents of the function keys in a form suitable for editing.
***INCLUDE** – Allows the main memory to be used for ROM development.
***MODIFY** – Memory editing in HEX/ASCII format.
***NAMES** – Lists the names and socket numbers of all resident ROMs.
***RAM** – Sends command directly to the RAM based ROM routine.
***REMOVE** – Removes RAM based ROM option.
***SPECIFY** – Selects the default ROM.
***DEFAULT** – Sends commands directly to the default ROM without having to give its name.
***STOP and *START** – Disable and enable any named ROM to completely eliminate command word clashes.
***STATUS** – Information about all the ROMs fitted in the machine including socket number, name, length, whether it is enabled, whether it has service or language entries etc.
***VALUES** – Gives ROM MANAGER status information, such as its socket number, how many ROMs have higher priority, number of default ROM and the identity of the current filing system.
***VECTOR** – Same as *DIRECT, just in case *DIRECT clashes with another ROM.
All selection between particular ROMs is by the name of the ROM and this may be abbreviated for convenience. ROM numbers can also be used if required. This ROM is very simple and obvious to use. All the facilities are explained in the clear and detailed manual.

Price **£22**



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.
In use as a debugging tool, you run code under a total emulation system. Everfelt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.
Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a vertual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being excuted at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£22



Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.
A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL, ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.
Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

ONLY **£18**

WATFORD – Always a step ahead

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	**£28**
Graphics ROM	**£28**
Disc Doctor ROM	**£28**

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

SPELLCHECK DISC

for Wordwise
Only: **£16**

BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in any of the following styles:

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

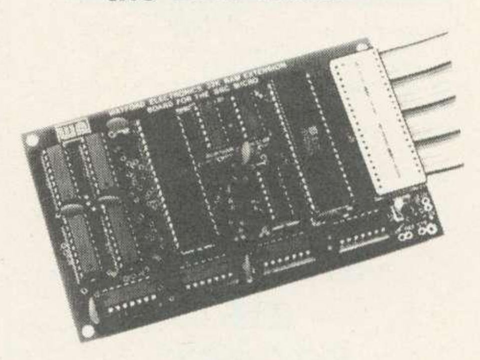
ABCDEFGHIJKLMNOP

It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V – press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.
You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.
A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

ONLY **£39**

NEW

Watford fills the gap with the 32K RAM EXPANSION BOARD for the BBC Micro



Now Watford Electronics brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. This compact board which fits inside the computer doesn't just give you 16k or even 20k of extra RAM, but a massive **32K !!!**
There are many more useful facilities available with this board:

- The top 20K of the expansion RAM can be used as the screen display memory, leaving all the standard BBC RAM free for programs or data storage. This allows good graphics and long programs to be combined. For instance you could have MODE 0/1/2 GRAPHICS AND 28K OF PROGRAM SPACE. The extra memory can be used by virtually any language or utility such as BASIC, VIEW, WORDWISE, Etc.
- The FULL 32K or the bottom 12K of the expansion RAM can be used as a PRINTER BUFFER for SERIAL or PARALLEL printers, sound channels, RS423, Keyboard or Speech Synthesiser. This allows very long text files to be printed while you are using 28K of program and 20K of graphics! THE BUFFER IS UNIQUE because it replaces one of the BBC Micro's buffers so all the buffer options are available on it. e.g. *FX15,21,138,145,ADVAL(–no.) etc.
- This board is the ideal complement to any word processing system, disc or cassette based. There is no need to wait for slow printers as you can type in long text in 80 column display mode while printing is going on – TWO JOBS DONE SIMULTANEOUSLY!!! (an equivalent printer buffer would cost you £120 +)
- Unlike our competitors, the board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion board, double density DFS Units and the ATPL ROM extension board. This is because our board is connected to the computer by means of a ribbon cable without soldering. It can be either be left in the micro or stuck to the lid with the 4 self adhesive feet supplied.
- The board comes with a comprehensive manual and ROM based software with a large range of commands for machine code and BASIC users, including many *HELP messages.

SPECIAL OFFER
Only: £69 (carr. £1)

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimension to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£99**

Continued

LIGHT PEN



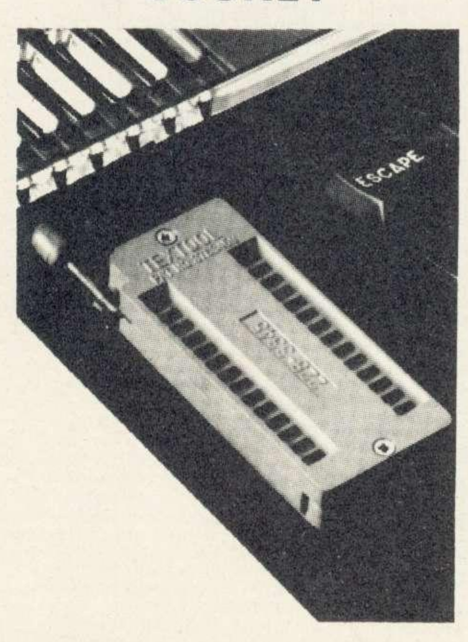
This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette (see elsewhere in this ad).

Only **£20**

(For software on disc please add £2)

NEW

SIDEWAYS ZIF SOCKET

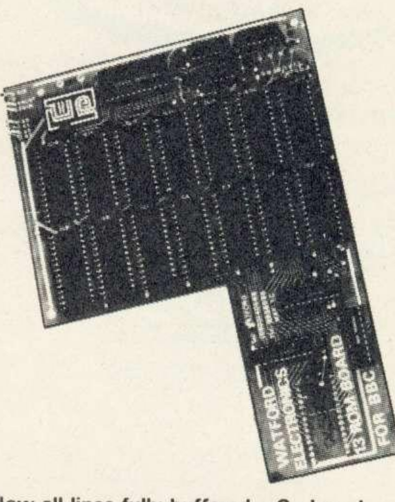


Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort – no screws to loosen or keyboard to remove.
The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

- Very simple to install. NO SOLDERING REQUIRED. The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.
- The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

ONLY **£16** (£1 carr.)

Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead).
Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

CHRISTMAS OFFER: £28 (carr. £1)

APPROVED for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use.

MODEM 84

PRESTEL TERMINAL

For the BBC Microcomputer



The Watford Prestel package consists of the B.T. approved Watford MODEM 84 (1200/75 baud full duplex 1200 baud half duplex direct connect) and a very sophisticated Prestel Terminal ROM.

This totally machine code software:

- is fully compatible with not only the Modem 84 but also with the PRISM 1000 and most other modems that require a data link via an RS423/RS232 port making it a worthwhile purchase for those who already have Modems.
- supports full Prestel colour alpha and graphic characters including double height, flashing, conceal/reveal.
- called by simple *PRESTEL (*P.) command. Disc and tape configurations fully supported.
- includes a comprehensive telesoftware downloader for BBC and other programs with continuous on screen status report (an essential facility).
- has very powerful OFF LINE MAILBOX editor allowing colour flashing graphic mailboxes to be prepared without having to be on line to Prestel.
- auto logon sequence can be burnt into ROM if desired.
- a vital 'TAG' facility allows tagging and recall of interesting pages, avoids that common and annoying 'NOW WHERE WAS THAT PAGE' problem.
- includes simple page and program loading and saving functions for both disc and tape, automatically assigning frame and program directories.
- not one but TWO PRINTER DUMP ROUTINES are provided within the software allowing either full graphics dump (mode 7 to EPSON compatible printers) or ASCII characters only.
- a user function built into the software allows interface with specialist routines, (yours as well as ours).

WATFORD'S 1200 BAUD FULLY AUTOMATIC USER TO USER SOFTWARE

The addition of the WATFORD user to user ROM based software enables you to discover a whole new world of data communication.
This software enables you to use the MODEM 84 very powerfully.

- Send and receive error checked programs and files (even WORDWISE files) to and from other users at 1200 baud.
- 8k file transfer in under 2.5 minutes (approx four times faster than with 300 baud modems).
- The transfer of data is totally AUTOMATIC which means that the modem is automatically switched between transmit and receive under software control.
- A chat mode is provided which also has this automatic switching for receive and transmit. (This mode is essential just before and after data transfer when both hand sets are replaced to reduce noise).
- A copy facility is provided which allows transmission of all screen output.
- A continuous on screen modem status report is included.
- The software is totally function key driven enabling easy transmission, reception, saving and loading of programs and files (Basic, Machine code or Data).
- A help menu is available from within the software as an aid to use.
- Full instructions are supplied.

PRICES

MODEM 84 (with Lead & Manual) **£68**
MODEM 84 complete with PRESTEL SOFTWARE ROM, Lead and Manuals **£82**
PRESTEL SOFTWARE ROM + Manual **£20**
USER to USER SOFTWARE ROM **£15**
(Carriage on Modem **£2**)

SURGE PROTECTOR Plug

Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. Suitable for computers, Hi-Fi, Fridge Freezers etc. Max. Surge current 2KAmp; max. Voltage 250. Essential for serious computer users.

Protection for only **£8.50**

BOOKS (No VAT on Books)

30 Hour BASIC (BBC Micro)	£6.95
35 Education Programs for BBC	£6.95
36 Challenging Games for BBC	£5.95
40 Educational Programs for BBC	£5.95
100 Programs for BBC Micro	£6.95
Cassette version of above	£10.00
6502 Application Book	£11.95
6502 Assembly Language Program	£13.95
6502 Assembly Language Subroutines	£14.25
6502 Machine Code for Beginners	£5.95
6502 Machine code for Humans	£7.95
6502 Software Design	£10.50
A young persons guide to BBC Basic	£4.50
A Beginners guide to LISP	£10.95
Advanced Machine Code Technique for BBC	£7.95
Advanced User Guide for BBC Micro	£11.95
Advanced Graphics with BBC	£9.95
Advanced 6502 Programming	£12.45
Assembly Language Programming on BBC Micro	£7.95
Advanced Programming Techniques for the BBC Micro	£7.95
BBC Basic	£7.95
Assembly Lang. Prog. on BBC	£7.40
BBC BASIC	£5.95
BBC Computer Magic	£5.50
BBC DIY Robotics & Sensors	£6.95
BBC Forth	£7.50
BBC Lisp	£7.50
BBC Micro An Expert Guide	£6.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Graphics and Sound	£6.95
BBC Micro Programs in Basic	£5.95
BBC Micro **ROM PAGING** System Explained	£2.00
BBC Micro Revealed	£6.95
BBC Micro Assembly Lang. Prog.	£7.95
BBC Micro Disc Companion	£7.95
BBC Micro in Education	£6.50
Basic Programming on BBC Micro	£5.95
CP/M The software BUS	£8.95
CP/M Users Guide	£13.95
Creating Adventure Programs on BBC Micros	£6.95
Creative Graphics Cassette (Acornsoft). Has 36 graphics programs	£8.95
Creative graphics on BBC Micro	£7.50
Complete Programmer for BBC	£5.95
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Discover BBC Machine Code	£6.95
Discover FORTH	£13.95
DIY Robotics & Sensors with BBC	£6.95
Exploring FORTH	£6.95
Further Prog. for BBC Micro	£5.95
FORTH Programming	£14.40
Functional Forth for the BBC Micro	£5.95
Games on your BBC Micro	£2.95
Games BBC Computer Can Play	£6.95
Getting more from your BBC & Electron	£6.95
Graphs & Charts on BBC Micro	£7.50
Graphic Art for BBC Computer	£5.95
Graphs and Charts (Cassette)	£7.50
Introducing the BBC Micro	£5.95
Introduction to FORTH	£9.30
Interfacing projects for the BBC Micro	£6.95
Introducing LOGO	£5.95
Let your BBC teach u to program	£6.45
LISP	£9.25
Logo Programming	£8.95
Mystries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering CP/M	£13.65
Programming the 6502	£11.95
Programming the Z80	£14.25
PASCAL	£9.25
Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
The Epson FX/KATA PRINTER Commands REVEALED	**£5.95**
Using Floppy Discs with BBC Micro	£5.95
Using BBC Basic	£6.95
Using 6502 Ass. Language	£14.50
Wordstar & CP/M made easy	£6.95

NEW LAUNCH

MYSTRIES OF DISC DRIVES AND DFS REVEALED

Are your tired of faulty cassettes and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford Electronic's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

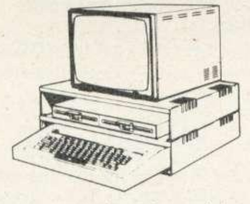
There is even a handy section describing the phrases you are likely to encounter, and how to interpret them. This book must be an essential purchase at £5.95, especially if you own or are thinking of buying a disc system. Why not ask for a copy for Christmas?

Price **£5.95** (Book – No VAT)

THE INVESTIGATOR

A utility program provided on disc to make security backup copies of all your valuable discs. Makes full use of all 8271 facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering. Price **£25**

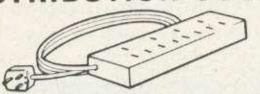
PLINTHS FOR BBC MICRO AND PRINTERS



Protect your computer from the weight and heat of your monitor. BBC micro plinths have slots for maximum ventilation. Single height version is suitable for BBC and monitor. Double height version allows the disc drives to be used in the centre section or stationary, etc. The computer slides easily into place, allowing easy access to remove the lid.
The printer plinth is equally sturdy but without the cooling slots. This allows the paper to be stacked under the plinth with the printer on top – a very convenient way to work as it does not require the usual very deep table.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£20** (carr. £2.00)
PRINTER PLINTH	**10** (carr. £1.50)

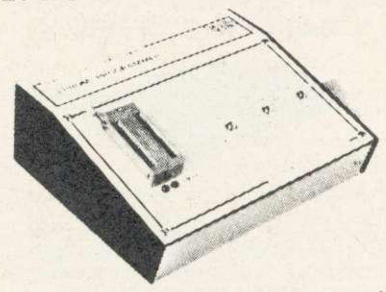
4 WAY MAINS DISTRIBUTION SOCKET



4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. Allows the whole system to be switched on from one plug.

£9.50

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and integrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

CHRISTMAS OFFER £69
(£3 carr.)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28**
- **ERASER GT** – Deluxe version erases up to 28 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30**
- Spare UV tubes. **£9**

VOLTMACE DELTA 14 JOYSTICK SYSTEM

The Voltmace system provides full facilities for connecting the Delta 14 handset.
Delta 14 handset – On its own makes a high quality centre sprung analogue joystick with fire buttons **£12.50**
Adaptor Module allows use of two joysticks and provides hardware to access all the keys on the keypad of the joystick **£12.55**
Transfer program allows use of the keypad keys and joystick to simulate any key on the keyboard. This works by creating a machine code patch that stays in memory while another program is loaded in. Allows any game to be used with joysticks. Supplied on disc or tape.

Tape **£5.10** Disc **£7.95**

STANDARD JOYSTICKS

These are standard analogue type with a fire button on each joystick. Twin joysticks go to a single moulded plug, long leads provided.

Single Player version **£7.00**
Two Players version **£12.00**

Continued

ANTI GLARE MONITOR SAFETY SCREEN



HEADACHES? TIRED EYES? Don't take pills — Use a Watford Electronics anti-glare filter! Considerable research into the possible health problems associated with monitor screens has shown that eye strain, blurred vision, watering, itching eyes and headaches can result after prolonged use. The problems are caused by extraneous reflections which force the eye to continuously re-focus to try to ignore them. The answer is our contrast enhancement, anti-glare filter which is similar to those which have been previously available on business systems, but at the low cost that you would expect for your personal computer. You will soon find the reduction in eye strain well worth your investment.

Features:

- Simple fitting with sticky Velcro pads.
- Easily removed for cleaning.
- Tinting improves colour quality and contrast.
- Works on monochrome or colour monitors.
- Curved instead of usual flat screen reduces edge distortion.
- Made in Britain by a long established glass maker.

Available in 9", 12" and 14" versions – please specify when ordering.

Introductory offer price: **£14.95**(carr.£1)

ATTACHE CARRYING CASE for BBC Micro

The Attache carrying case is attractively finished in mottled antique brown leatherette. The case is made of tough plywood, providing a very solid and safe way to carry your BBC micro. There is room provided to fit all the leads necessary behind the computer and manuals in the front. Locks supplied with two keys. Price **£12** (£2 carr.)

DATA RECORDER AND ACCESSORIES

Top quality slimline portable cassette recorder designed specifically for use with home computers. Mains/Battery operated with tape counter. **£20**

DATA CABLE to connect recorder to BBC **£2.50**

DATA CASSETTES

Top grade tested C12 Data cassettes supplied in library cases **35p** each; 10 for **£3.20**.

ASSORTED CONNECTING LEADS

(All ready made and tested)

CASSETTE LEADS 7 pin DIN Plug	
to 5 pin DIN Plug + 1 Jack Plug	**£2.00**
to 3 pin DIN Plug + 1 Jack Plug	**£2.00**
to 7 pin DIN Plug	**£2.50**
to 3 Jack Plugs	**£2.00**
6 pin DIN to 6 pin DIN Plug (RGB)	**£2.50**
MONITOR LEADS	
Microvitec RGB leads 6 pin DIN to 6 pin DIN for colour monitors.	**£2.50**
KAGA/SANYO Colour Monitor Leads	**£5.00**
Monochrome monitor leads	
BNC to Phono	**£3.00**

DISC DRIVE POWER LEADS

Supply from BBC power supply to standard Disc Drive connector.

Single **£3.00** Dual **£3.75**

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 PIN DIN)	30p	45p
RS423 (5 pin Domino)	40p	50p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
Paddles)15 pin 'D')	110p	215p
BBC Power Plug 6 way	80p	–
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PAINTING *by* PROGRAMS

Tessie Revivis explains how to create text and graphics windows for the Electron and Beeb

LAST month we established how a program could be written neatly and be made easy to follow by contructing it as a series of simple program building blocks called procedures. These PROCs were used to allow us to design a variety of shapes that could be built up to form a picture. This month, using the structured programming approach, we shall see how simple procedures can be manipulated to provide the basis for a creative graphics paintbox-type program.

The entire program listing can be found on the yellow page 99, and a sectional description of it is included. It incorporates the use of several commands new to First Byte, so let's have a close look at these first – they include text windows and graphics windows.

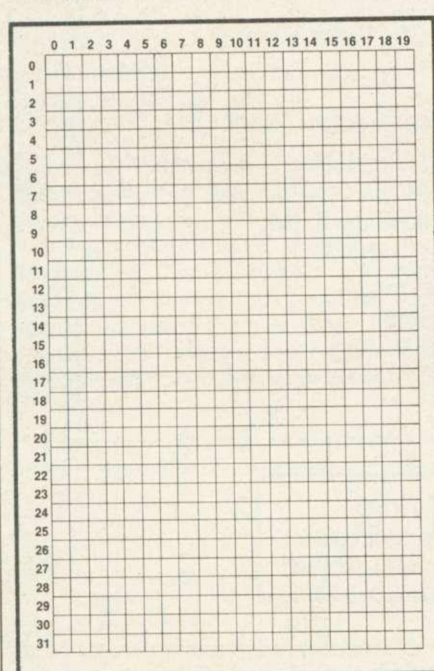


Figure 1. Mode 2 text layout

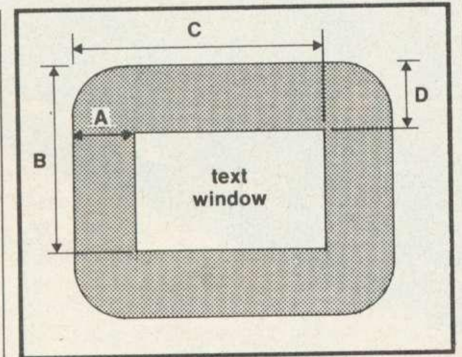


Figure 2. Defining a text window – VDU 28, A, B, C, D

When we think of a window, we imagine a hole in the wall filled with sections of glass that allows us to see through to what lies beyond. In computer terms, we can think of a window in much the same way, but unlike the real thing our viewing position is fixed – we sit on a seat and look at the TV screen, so we see only one view. To counteract this, windows on the Electron and Beeb screen can be positioned anywhere we wish at the start of the program.

Windows can be of two sorts – text windows and graphics windows. In the former text may only be displayed in a text window and nowhere else on the screen. Similarly, any graphics displays produced by your micro are confined to the graphics windows. These text and graphics windows are always in use, and have default values which are both exactly equal to the normal screen size, so that all text and graphics appear on the screen.

Redefining a window is quite a simple task, but as text and graphics windows are arranged differently each must be defined separately. Text is printed onto the screen as a series of letters which each occupy a position both across and down the screen, in rows and columns. By giving each of these rows and columns a number, starting with row 0, column 0 at the top left-hand corner of the screen, each text position can be defined. Thus the second text position across and down the screen would have the text co-ordinates 1,1.

The actual number of text columns and rows on a screen will depend on the screen mode selected. As the paintbox program utilises mode 2, we'll stick with that for our examples. Figure 1 shows the general layout – as you can see it's arranged as 32 rows of 20 characters. The character position of the bottom right hand corner would be 31,19 – remember we use values one less than might be expected as the co-ordinates start at 0,0.

To define a new text window we use the VDU 28 command followed by four values which correspond to the co-ordinates of the four text window co-ordinates. Figure 2 shows the organisation exactly. The entire VDU command is:

```
VDU 28, A, B, C, D
```

where A, B, C, and D are the values relating to the desired position.

To define a text window that limits text to the bottom two lines of the screen only we would need to type:

```
VDU 28, 0, 31, 19, 29
```

As we only want to change the depth of the window, we only need to alter the value of the 'top' of it. To see the effect it has, type and RUN the following program:

```
10 REM Text Window Demonstration
20 MODE 2
30 VDU 28, 0, 31, 19, 29
40 FOR N% = 0 TO 1000
50 PRINT N%
60 NEXT N%
70 END
```

Now list it and you should see that the program listing is confined to the bottom two lines of the screen! To restore the text window to its normal value, simply hit the Break key and type OLD if you wish to recover your program for further experimentation. Remember that all text-screen associated commands will be confined to

See yellow pages 99 and 100 for Tessie Revivis' picture designer program and sectional description

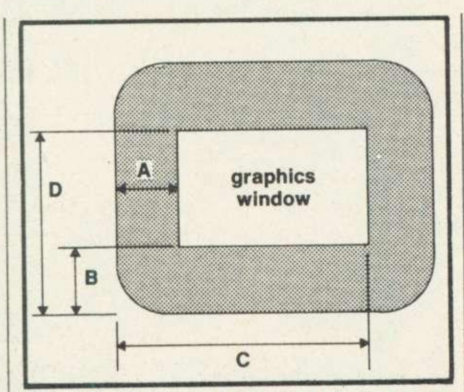


Figure 3. Defining a graphics window – VDU 24, A; B; C; D;

the text window – even CLS will only clear the text window screen.

A graphics window can be defined in a similar way using a VDU 24 command. The co-ordinate system used is different though, as it starts from the bottom left-hand corner of the screen and runs 1027 points across it and 1023 up it – see last month's First Byte for further details. Figure 3 shows how a graphics window is defined using the following command:

```
VDU 24, A; B; C; D;
```

You will note that each of the four variables are postfixed by a semi-colon and not a comma as might be expected – an important difference between the two windows and vital if they're to work correctly. Try the following short program that demonstrates how the graphics window works:

```
10 REM Graphics Window Demo
20 MODE 2
30 VDU 24, 200; 200; 900; 900;
40 GCOL 0,129
50 CLG
60 GCOL 0,3
70 MOVE 0,0
80 MOVE 1279,0
90 PLOT 85, 640,100
```

Again, all commands that affect the graphics screen are confined to the graphics window.

As you might have guessed, it's possible to have graphics and text windows on the screen together and operational at the same time. As an exercise, try writing a program that uses the left hand side of the screen for graphics and the right hand side for text. The picture designer program uses dual windows to confine text to the very bottom line of the screen.

Using the picture designer

Creating pictures with the picture designer program is simplicity itself. When you run the program the screen should clear to black with a white border with a status line at the bottom of the screen printed in the text window. The status line should look like this:

```
X, Y: 500,500
```

The values 500,500 refer to the current co-ordinates of the imaginary pen the program draws with. All shapes are drawn from this position. The C at the end of the line refers to the current drawing colour (or if you like, the colour of the ink in the pen). Thus any shapes will be in the same colour as the C, and as we're in mode 2 there are sixteen to chose from.

The four cursor arrow keys ↑ ↓ → and ← move the position of the 'pen'. Try pressing each of these – you should see the co-ordinates on the co-ordinate line change. If you press the up arrow key, the X axis co-ordinate will increase. Similarly, pressing the down arrow key will decrease its value. The left and right arrow keys work in the same vein on the Y axis value. Thus, by using combinations of these keys, the pen can be moved around the screen.

Shapes and lines are drawn onto the screen using the function keys. Figure 4 lays out a suitable function key strip that can be placed above them to remind you of their uses.

f0: Draws, from the bottom left-hand corner, a square or rectangle onto the screen. When you press this key the status line clears and you are prompted for 'X:', which is the length of the X axis side of the square. After entering a suitable numeric value and pressing return, you are requested to enter the length of the Y axis side, which should be performed in a similar manner. When this has been done, a square or rectangle is drawn to the side lengths specified and in the colour of C on the status line, which now reappears.

f1: This draws a circle whose centre is the position of the pen. Its radius should be entered when asked for.

f2: Plots a line from the current position of the pen to the X and Y co-ordinates that you are requested to enter.

f3: Simply makes a single dot at the X and Y co-ordinates you are prompted to give.

f4: Draws a dotted line from the current position of the pen to the X and Y co-ordinates that you are asked for.

f5: This draws and fills a triangle using the PLOT 85 command. The pen position is used to mark the top, or apex, of the triangle. You are then requested to give four values marking the left-hand (LX,LY) and right-hand (RX, RY) co-ordinates of the shape.

f6: Draws a line to the left and right of the pen's current position until a change in the background colour is encountered. Used in conjunction with the cursor arrow keys this can be used to fill solid and enclosed areas.

f7: Compliments f6 and will erase a line across the screen from the current pen position until a different background colour is encountered.

f8: Alters the current plotting colour (or the colour of the ink in the pen) to one of the sixteen available and all subsequent lines are drawn in it. As the key is pressed, the colour values are incremented and the colour of the C on the status line indicates the new shade.

f9: Allows the contents of the screen to be saved to tape or disc, so that they can be reloaded for editing or display at a future date. A suitable program to do this would be:

```
10 REM display picture
20 MODE 2
30 *LOAD SCREEN
```

Expanding the program

Like all programs, the picture designer can be expanded to make it more versatile or to include extra features which you find desirable. For example, to get you started, why not try adding a cross-hair that moves around, indicating the current position of the pen on the screen? This might not be as easy as you think, but that's the fun of computing – though you might not think so at the time!

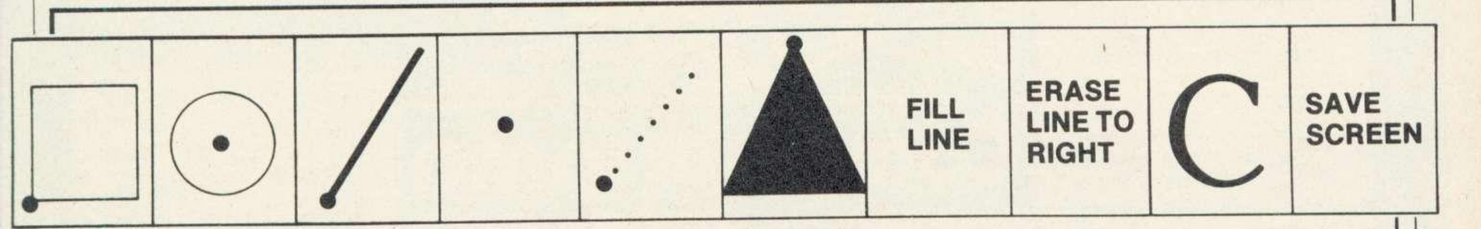
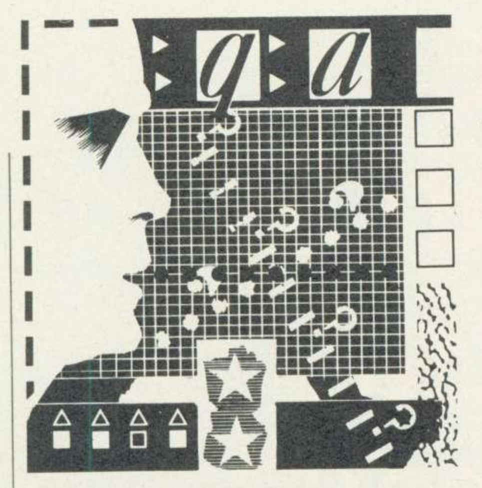


Figure 4. The picture designer keystrip



Control codes for Epsons, the command line interpreter and improving your micro's memory are among Martin Phillips' subjects

£5 Control codes for Epsons

MANY letters I receive for this column follow up items included in earlier Hints and Tips. Some ask for further help with topics covered, others offer alternative methods or extend the information given. The £5 prize this month is well-deserved by Mr Tozer from Stoke-on-Trent, who was prompted to send in a full list of Epson FX80 control codes after seeing the one included in the August issue. It not only includes a full printout, but also a *Wordwise* listing which is available on this month's *Acorn User* tape. It's in alphabetical order, well set out and printed in condensed mode so it will fit onto one sheet of printer paper. It also gives reference to the Epson handbook page number. To send these codes directly from the keyboard or a program using the VDU commands, it is necessary to precede each number by a 1, eg, to switch on the emphasised printing you type

VDU1,27,1,69

after first initialising the printer with the VDU2 command or using CTRL-B.

For those readers with the Epson MX80 type III or Epson RX80 printers, I include a list of commands for them on page 47. Many are the same as the FX80, but there are some omissions, as they have fewer features – for instance they don't have definable characters or reverse feed, or some of the advanced horizontal and vertical TAB features.

Micro amnesia

A PROBLEM soon encountered on the BBC micro is shortage of memory. This causes endless difficulties when using modes 0,1 or 2 as these leave the user with little memory. The programmer is seldom able to use 32k of memory, as the computer often claims some of that for itself.

If one starts at the bottom of the memory map (figure 1) (ie, at memory location 0), much of this is reserved for the computer's own use, as a work-space to store variables, pointers and the various buffers needed, followed by the start of the user's memory. This boundary is movable depending on what's been fitted to the computer, and its position is given by PAGE. This is normally set to &E00 (3584 decimal), so the user has already lost 3.5k of the 32k. Matters get worse if a disc filing system is fitted, as PAGE now becomes &1900 (6400), or worse still if Econet or Teletext are installed. With all those fitted the user has lost about another 12k of memory.

Starting at the top of the 32k memory map, the computer grabs some memory to store the screen display. In mode 7 this is 1k, 10k in mode 4, and 20k in mode 1! By now the space left for the user is far short of the 32k the machine so invitingly offers at switch on. The position of the start of memory taken for

EPSON FX80 CODES

DESCRIPTION	CODE	DETAIL	PAGE
Backspace	8	backspace one place	3.7
Bell	7	sounds bell	3.6
Bit image set (8)	27,m,n,o	selects various 8 bit graphics modes	3.49
(9)	27,94,....	selects various 9 bit graphics modes	3.53
MSB to 0	27,61	sets msb of following 8-bit data to 0	3.61
MSB to 1	27,62	sets msb of following 8-bit data to 1	3.62
MSB cancel	27,35	cancels above codes	3.63
normal density	27,75,....	following data printed as bit images	3.75
dual density	27,76,....	following data printed as bit images	3.81
d.d. double speed	27,89,....	as above but faster and no adjacent dots	3.97
quadruple density	27,90,....	as above but darker	3.97
Cancel	24	deletes previous data in print buffer for same line	3.8
Carriage return	13	carriage return	3.12
Condensed mode on	15	stored and subsequent data printed condensed	3.14
on	27,15	as above	3.28
off	18	cancels above	3.16
Control code select	27,73,n	n=1/49 selects codes 0-31 as printable n=0/48 selects as unprintable	3.72
Delete	127	deletes previous char. in print buffer	3.19
Double strike set	27,71	sets double strike mode	3.71
cancel	27,72	cancels above	3.71
Download def'n.	27,38,....	defines download characters	3.38
select	27,37,1,0	selects previously defined set	3.36
cancel	27,37,0,0	selects ROM character set	3.36
ROM copy	27,58,0,0,0	copies ROM character set to download character set	3.59
Elite mode set	27,77	following data printed in elite size	3.84
cancel	27,80	cancels above i.e. returns to normal print	3.88
Emphasized mode set	27,69	all following data printed in emphasized mode	3.70
cancel	27,70	cancels above	3.70
End of paper on	27,57	selects end of paper detector	3.31
off	27,56	deselects end of paper detector	3.31
Enlarged mode set	14	enlarged for one line	3.13
set	27,14	as above	3.28
set	27,87,n	n=1/49 all following data printed enlarged n=0/48 cancels	3.96
cancel	20	cancels that set by 14	3.19
Expansion on	27,54	codes 128-159 & 255 are set as printable, see download	3.29
off	27,55	cancels above	3.30
Form feed	12	executes form feed	3.12
length lines	27,67,n	sets form length as n lines	3.67
length inches	27,67,0,n	sets form length as n inches	3.68
Half speed	27,115,n	n=1,49sets half speed print n=0,48 cancels	3.107
Incremental print	27,105,n	n=1/49 sets print and view n=0/48 cancels	3.100
Indent	27,108,n	sets n character left margin	3.103
Initialise	27,64	initialises printer, including clearing buffer	3.64
International set	27,82,n	prints following data from n character set	3.90
Italics on	27,52	prints all following data in italics	3.25
off	27,53	cancels above	3.28
Line feed forward	10	executes line feed	3.10
reverse	27,106,n	executes n/216" reverse feed	3.101
Margin set	27,108,n	sets n character left margin	3.103
Mode select	27,33,n	selects one of 63 type faces	3.32
On	17	enables printer	3.15
Off	19	disables printer	3.16
Page width	27,81,n	sets page width to n characters	3.89
Paper feed	27,74,n	executes an n/216" paper feed (0<=n<=255)	3.74
Proportional spacing	27,112,n	n=1/49 sets proportional spacing n=0/48 cancels	3.104
Re-set	27,64	initialises printer, including clearing buffer	3.64
Reverse feed	27,106,n	executes n/216" reverse feed	3.101
Skip over perforation	27,78,n	skips n lines at page bottom	3.85
cancel	27,79	cancels above	3.87
Slow speed	27,115,n	n=1,49sets half speed print n=0,48 cancels	3.107
Spacing 1/8"	27,48	sets subsequent line spacing to 1/8"	3.21
7/72"	27,49	sets subsequent line spacing to 7/72"	3.22
1/6"	27,50	sets subsequent line spacing to 1/6"	3.23
n/216"	27,51,n	sets subsequent line spacing to n/216"	3.24
n/72"	27,65,n	sets subsequent line spacing to n/72" i.e. dots width	3.65
Subscript set	27,83,n	n=1/49sets subscript mode	3.93
cancel	27,84	cancels above	3.94
Superscript set	27,83,n	n=0/48 sets superscript	3.92
cancel	27,84	cancels above	3.94
Tab horizontal	9	executes horizontal tab	3.9
horizontal	27,68,....	sets horizontal tabs	3.69
vertical	11	executes vertical tab	3.11
vertical set	27,98,....	sets 8 channels of vertical tabs	3.98
vertical	27,47,n	executes n th format vert. tabs e.g. one format for each of seven pages	3.56
vertical	27,66,....	defines vertical tab positions	3.66
Underline	27,45,n	n=1/49selects underline, n=0/48 deselects underline	3.55
Unidirectional print	27,60	prints from left to right for single line	3.60
	27,85,n	n=1/49 sets unidirectional print n=0/48 sets bidirectional print	3.95

Epson FX80 control codes, with page references to Epson handbook

IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

screen display is given by HIMEM. The computer uses from HIMEM to the top of the 32k memory.

So, the computer grabs some of the 32k at the bottom of the map for its own use, and some at the top for the screen display. The user is left with what remains in the middle, ie that memory between PAGE and HIMEM. In fact he or she cannot even use all this as space needs to be left at the end of the program for the computer to store things such as values of variables or positions of procedures that are required by the Basic program. The end of the user's program is given by TOP. LOMEM normally has the same value as TOP and is the start location for the program variables storage area.

The user is, therefore, left with precious little of that magic 32k and the offer of extra memory is an exciting proposition. Several readers have asked for more information about such devices. There are boards that offer an extra 20k of memory, there is the second processor which offers 64k, there are sideways ROM boards which can also have 16k of RAM added, and boards which offer up to 128k of memory. It's almost impossible to give a simple answer to this question and say whether they are worthwhile or a waste of money. In many cases the value of such add-ons depends on their intended use.

There are several points which readers might find helpful when deciding to add extra memory options. First, I'll take the 6502 second processor.

page 52 ▶

EPSON MX80 TYPE III CODES

DESCRIPTION	CODE	DETAIL	PAGE
Backspace	8	backspace one place	66
Bell	7	sounds bell	66
Bit image			
normal density	27,75,....	following data printed as bit images	67
dual density	27,76,....	following data printed as bit images	67
Carriage return	13	carriage return	50
Condensed mode on	15	stored and subsequent data printed condensed	60
off	18	cancels above	61
Delete	Delete previous char. in print buffer		67
Double strike set	27,71	sets double strike mode	62
cancel	27,72	cancels above	62
Emphasized mode set	27,69	all following data printed in emphasized mode	69
cancel	27,70	cancels above	62
End of paper on	27,57	selects end of paper detector	66
off	27,56	deselects end of paper detector	66
Enlarged mode set	14	enlarged for one line	60
set	27,87,n	n=1 all following data printed enlarged, n=0 cancels	64
cancel	20	cancels that set by 14	61
Form feed	12	executes form feed	50
length lines	27,67,n	sets form length as n lines	57
length inches	27,67,0,n	sets form length as n inches	57
Initialise	27,64	initialises printer	66
International set	27,82,n	prints following data from n character set	63
Line feed forward	10	executes line feed	50
Page width	27,81,n	sets page width to n characters	53
Paper feed	27,74,n	executes an n/216" paper feed (0<=n<=255)	59
Skip-over perforation	27,78,n	skips n lines at page bottom	58
cancel	27,79	cancels above	58
Spacing 1/8"	27,48	sets subsequent line spacing to 1/8"	55
7/72"	27,49	sets subsequent line spacing to 7/72"	55
1/6"	27,50	sets subsequent line spacing to 1/6"	56
n/216"	27,51,n	sets subsequent line spacing to n/216"	56
n/72"	27,65,n	sets subsequent line spacing to n/72" i.e. dots width	54
Subscript set	27,83,1 sets	subscript mode	63
cancel	27,84	cancels above	64
Superscript set	27,83,0 sets	superscript	63
cancel	27,84	cancels above	64
Tab horizontal	9	executes horizontal tab	51
horizontal	27,68,....	sets horizontal tabs	51
vertical	11	executes vertical tab	50
vertical	27,66,....	defines vertical tab positions	56
Underline	27,45,n	n=1 selects underline, n=0 deselects underline	65
Unidirectional print	27,85,n	n=1 sets unidirectional print, n=0 sets bidirectional print	67

EPSON RX80 CODES

DESCRIPTION	CODE	DETAIL	PAGE
Backspace	8	backspace one place	3.25
Bell	7	sounds bell	3.50
Bit image			
normal density	27,75,....	following data printed as bit images	3.57
dual density	27,76,....	following data printed as bit images	3.63
d.d. double speed	27,89,....	as above but faster and no adjacent dots	3.66
quadruple density	27,90,....	as above but darker	3.66
Carriage return	13	carriage return	3.5
Condensed mode on	15	stored and subsequent data printed condensed	3.14
on	27,15	as above	3.17
off	18	cancels above	3.16
Delete	127	deletes previous char. in print buffer	3.49
Double strike set	27,71	sets double strike mode	3.21
cancel	27,72	cancels above	3.21
Elite mode set	27,77	following data printed in elite size	3.9
cancel	27,80	cancels above i.e. returns to normal print	3.10
Emphasized mode set	27,69	all following data printed in emphasized mode	3.19
cancel	27,70	cancels above	3.20
End of paper on	27,57	selects end of paper detector	3.51
off	27,56	deselects end of paper detector	3.51
Enlarged mode set	14	enlarged for one line	3.11
set	27,14	as above	3.17
set	27,87,n	n=1/49 all following data printed enlarged n=0/48 cancels	3.13
cancel	20	cancels that set by 14	3.12
Form feed	12	executes form feed	3.8
length lines	27,67,n	sets form length as n lines	3.43
length inches	27,67,0,n	sets form length as n inches	3.43
Half speed	27,115,n	n=1,49sets half speed print n=0,48 cancels	3.55
Indent	27,108,n	sets n character left margin	3.47
Initialise	27,64	initialises printer	3.53
International set	27,82,n	prints following data from n character set	3.29
Italics on	27,52	prints all following data in italics	3.26
off	27,53	cancels above	3.26
Line feed forward	10	executes line feed	3.6
Margin set	27,108,n	sets n character left margin	3.47
Page width	27,81,n	sets page width to n characters	3.46
Paper feed	27,74,n	executes an n/216" paper feed (0<=n<=255)	3.7
Re-set	27,64	initialises printer, including clearing buffer	3.53
Skip over perforation	27,78,n	skips n lines at page bottom	3.44
cancel	27,79	cancels above	3.45
Slow speed	27,115,n	n=1,49sets half speed print n=0,48 cancels	3.55
Spacing 1/8"	27,48	sets subsequent line spacing to 1/8"	3.32
7/72"	27,49	sets subsequent line spacing to 7/72"	3.33
1/6"	27,50	sets subsequent line spacing to 1/6"	3.34
n/216"	27,51,n	sets subsequent line spacing to n/216"	3.35
n/72"	27,65,n	sets subsequent line spacing to n/72" i.e. dots width	3.36
Subscript set	27,83,n	n=1/49sets subscript mode	3.22
cancel	27,84	cancels above	3.24
Superscript set	27,83,n	n=0/48 sets superscript	3.22
cancel	27,84	cancels above	3.24
Tab horizontal	9	executes horizontal tab	3.37
vertical	11	executes vertical tab	3.38
Underline	27,45,n	n=1/49selects underline, n=0/48 deselects underline	3.10
Unidirectional print	27,68	prints from left to right for single line	3.52
	27,85,n	n=1/49 sets unidirectional print n=0/48 sets bidirectional print	3.54

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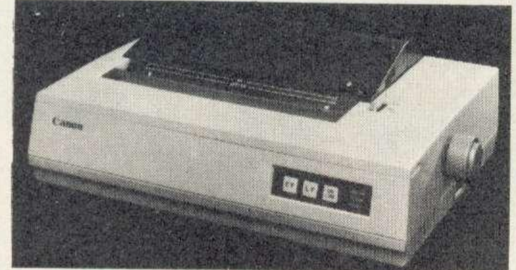
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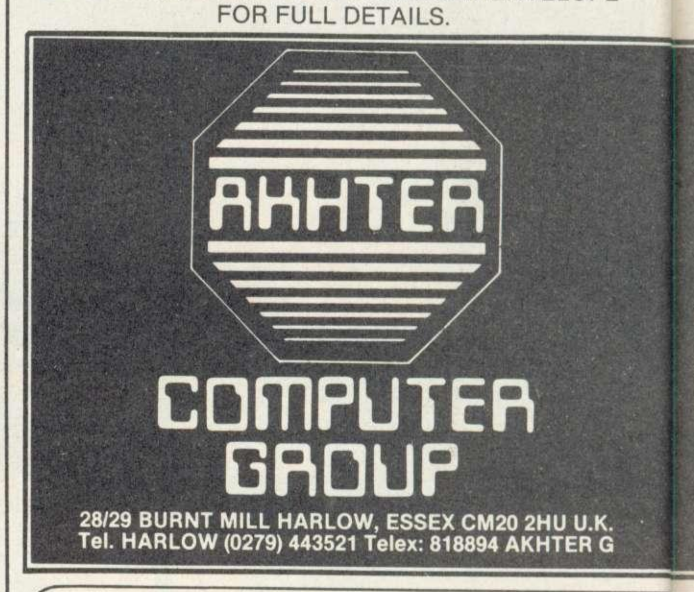
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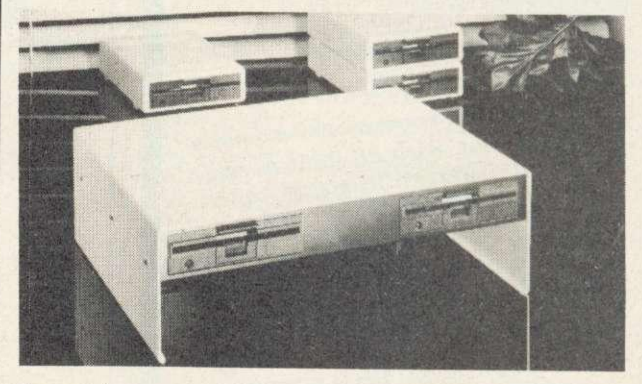
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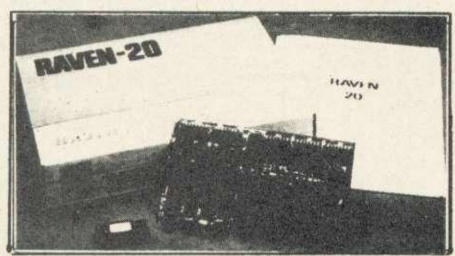
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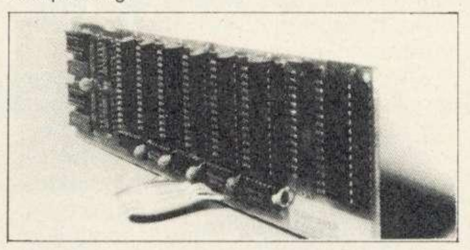
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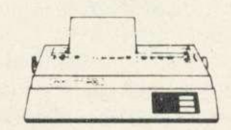
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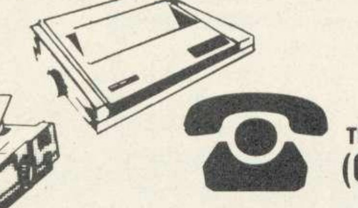
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◀ page 47
When this is added to the BBC, the user ends up with about 44k of memory, because the second processor still needs some memory for itself, although not as much as a normal Beeb. It uses the BBC as a slave computer, and mostly makes use of features concerned with inputting or outputting information. The second processor is not concerned with screen display, so no memory is reserved for this – a great bonus for the user. As it's using the BBC to perform many of its tasks, it's able to do its work faster, and the system works more quickly.

The worst problems with the second processor are that many programs will not run on it because of the way they are written, and the lack of software created to take advantage of the extra memory. If a program will run on the standard BBC there's little to be gained by buying a second processor, unless the program allows the user to take advantage of that extra memory. An example is a graphics creation program such as Bitstik.

Often one wants to share a program one has developed, but care must be taken to ensure that others have similar equipment, or that it will run on a standard computer. One program that could be used to advantage on the second processor is *Wordwise*, but the current version will not work. It comes down to the usual story – such add-ons are only as good as the software available for them.

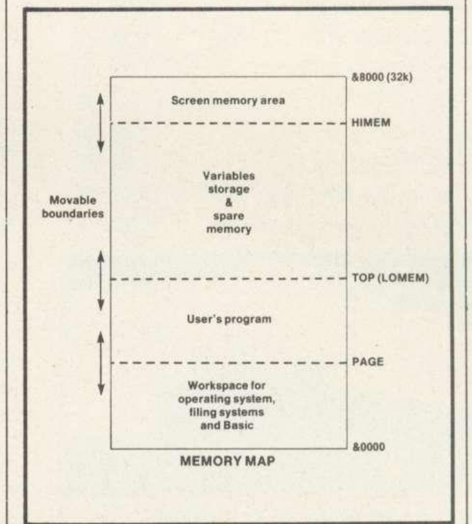
The review of the Aries B20 20k RAM expansion board in April's *Acorn User* highlighted the problems I've raised. This board also needs special software which is included in ROM form. This could cause more difficulties if ROM space was at a premium, especially as most other ROM boards cannot be fitted at the same time. It's not possible to fit such a board, expect all programs to work with it and make use of the extra memory. For instance a special version of *Wordwise* is needed.

There are several sideways ROM boards available which allow extra ROMs to be fitted, and often also up to 16k of RAM. This extra 16k can't generally be used to provide more room for running programs, but it does enable software intended to be put into ROM to be more easily developed, and can be used for special functions such as a print buffer (with suitable software).

ROM boards aren't free of problems either. Some need to have tricky soldered connections when being installed, and some have wires pushed into integrated circuit sockets alongside the chip lead (no-one will ever convince me this is a satisfactory method). Only a few have truly solderless fitting. There can also be problems with the power they draw from the BBC. However, there are sideways ROM boards that are carefully designed, easy to fit and operate almost unnoticed inside the Beeb.

Lastly, there's the Solidisc system – a memory expansion board that enables ROM software to be stored on disc and then loaded into these areas of RAM. As with the other systems it has its advantages and disadvantages but I wonder how long it'll be before software houses making ROM software will find a way of preventing it being copied onto disc and then loaded into sideways RAM – as it stands, the simplest way to copy ROM software.

To many people, 'extra memory' implies that when such memory is fitted, one will, perhaps, see a message appear on the screen saying "BBC Computer 64k", and have all the extra



How the memory is divided

memory on hand in the same way that it could be added to a model A. The fact is that the Beeb has as much memory available as its architecture will allow (with the possible exception of the sideways ROMs), and adding any more has to be done using one or more tricks. This is why, with the exception of the second processor, such memory add-ons are rather awkward to fit onto the BBC main circuit board and all programs don't automatically work without alteration.

To sum up, in order to get the best out of any of these systems the software needs to be written to take advantage of the extra memory, and as yet there is little of this about. Such memory can be used for one's own programs, but others must have the same memory expansion to run them. Sideways ROMs have proved useful for some applications such as word processors and utilities programs, and one of the better boards is a useful investment if you intend to purchase several ROMs. Think carefully about the other forms of extra memory before buying to ensure they will meet your requirements. I suspect such devices as the 6502 second processor will only become popular when there is a range of software to take advantage of the extra memory offered.

Command line interpreter

BBC Basic as used on the Electron and the BBC is one of the best versions of Basic around for a micro. As well as the Basic statements there are a range of operating system calls (all the * calls) which give the programmer access to many functions that otherwise would be difficult to program. Sometimes one can come unstuck trying to combine Basic commands with operating system commands – for instance, *MOTOR. *MOTOR 1 switches on the cassette motor relay (and the LED indicator on the keyboard of the BBC) and *MOTOR 0 switches it off again. Try the program shown in listing 1.

Line 20 inputs either a "Y" or an "N" into the string A$. Line 30 will put the value 1 into the variable N if A$ contains "Y", otherwise it will return the value 0. This routine, therefore, gives a default value of 0, and only returns a value of 1 if "Y" is detected. The variable N is then used with the *MOTOR command to switch the relay on or off.

When the program runs, the error "Bad command at line 40" appears, because once the Basic interpreter comes across an operating system command, *the rest of that line* is passed to the operating system. Line 40 tries to use a Basic variable in an operating system command, with the result that the operating system does not understand the variable N.

There are many examples where an ability to include variables or strings into operating system commands would extend the range of options open to the programmer, or simplify routines. As might be expected, Acorn have thoughtfully provided such a means, but it's not very well documented in either the Electron or the BBC *User Guide*. Another problem is that there's a simpler method of use which will only work on the Electron or the BBC fitted with either Basic 2 or Hi-Basic (supplied with the second processor).

This routine is called the Command Line Interpreter (CLI) and listing 2 shows how it can be accessed. First, an array 20 bytes long needs to be defined. This is done in line 20. Notice the differ-

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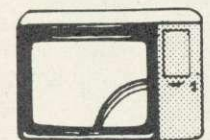


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ence from defining an array 20 *elements* long, which would have been defined DIM B(20). Here we are reserving 20 bytes of memory only, and the string to be put into the CLI is stored in that area of memory. (The "*" does not need to be included). This is done by starting line 50 $B and not B$, equivalent to poking a string into a specific area of memory, the variable B defining the start point in memory of that string. The start point then needs to be put into X% and Y%, X% being the low byte, and Y% the high byte. Once this has been done, the CLI can be called up at &FFF7.

In this way we have been able effectively to put a variable into an operating system call. The routine can be tidied up somewhat – for instance instead of writing X% = B MOD 256, it can be written X% = B, as only the low byte will be accessed anyway. A trap for the unwary exists here, as a space must be left between the B and MOD otherwise the computer assumes BMOD to be a variable name! Also it's not necessary to define X% and Y% each time as they don't change, so they can be put in at the start, outside the loop. Listing 3 shows these changes.

Basic 2 recognises the importance of the CLI and provides a new keyword to simplify its use. It's available on all Electrons, newer BBCs and BBCs fitted with Hi-Basic. The keyword is called OSCLI (Operating System Command Line Interpreter). Listing 4 shows how it works. Readers with Basic 1 will get the "Syntax error at line 40" error if they try this program. It should be stressed that if you're writing a program which uses the CLI and you intend it to work on a variety of BBCs, then don't use the OSCLI keyword, use the longer form which will work on any machine.

Electron owners can use the OSCLI provided they don't intend to use the program on a BBC machine. It's very unlikely that a time will come when all machines are upgraded to Basic 2, as was the case when the 0.1 operating system was upgraded to the 1.2, but there were far fewer 0.1 chips about, and enough improvements were made to make it worth changing.

What can CLI be used for? Any of the *FX calls, any of the operating system file handling calls (*CAT, *LOAD, *SAVE, *SPOOL, *EXEC, *OPT, *RUN, *DISC, *TAPE, etc), to program the function keys (*KEY), or for the filing system calls (*DRIVE, *DIR, *COPY, etc). Listings 5 and 6 are two versions of a program to define the function keys. Nothing special you might think, and rather a long way round a simple problem, but, apart from demonstrating the use of the command line interpreter, they allow the key definitions buffer to be examined, loaded or saved – useful if a different set of definitions needs to be called up from within a program. All that's needed within the program is to *LOAD the particular file to change the definitions.

If using a disc system this feature is especially useful, and it's also possible to use the command line interpreter to catalogue the disc before loading or saving a file, enabling a check to be made for an existing filename. This is done by entering the following lines for listing 5:

```
 95 PROCoscli ("CAT")
235 PROCoscli ("CAT")
```

and for listing 6 the following similar lines:

```
 95 PROCOSCLI "CAT"
235 PROCOSCLI "CAT"
```

The program also uses the command line interpreter to enter each key definition once defined.

The function key buffer starts at location &B00 and ends at location &BFF. The first 16 locations store the start pointers – one from the beginning of the buffer for each of the 16 keys (don't forget that the Break key and the editing keys can also be used as function keys, using *FX4). Location 17 of the buffer stores the first free space location, the free space pointer. As the key definitions are stored in the buffer in the order in which they're programmed, it's necessary to look through the other 15 start pointers to determine the location of the end of a particular key definition. If any key is not defined then its start pointer will have the same value as the free space pointer.

Quick fire questions

THE easiest way to clear the screen in any mode is to press the control key and the 'L' (usually written CTRL-L) at the same time.

THE commands available using the control key pressed with another key, such as CTRL-L mentioned above, or CTRL-B to switch on the printer, can be included at the end of a command such as List. Using CTRL-L after List will clear the screen after the command has been written on it but before the program is listed. Type LIST, then CTRL-L and press Return. This is especially useful when sending listings to the printer, and avoids having commands such as the List being printed out as well.

ON a disc BBC machine, pressing function key f9 at the same time as Break will reset the BBC to cassette operating system, although PAGE will remain at &1900.

WHEN using the cursor control keys to copy a line of a listing near the top of the screen, it's quicker to move the cursor down off the bottom of the screen to take it back to the top. Similarly, to position the cursor at the right of the screen, move the cursor off the left side and it will reappear on the right on the line above.

Headphones halt headaches

IS it possible to use headphones with the BBC to prevent annoying the rest of the family, asks Mr E Stanley from Hayes, Middlesex? The speaker for the BBC is mounted on the keyboard circuit board. Its two leads plug into the main circuit board at the front left, but could equally well be connected to a headphone socket. It's possible to use the switches fitted to headphone sockets to cut out the internal speaker only if the headphones are plugged in.

It's also possible to stop all the sound using a *FX call. Sound can be turned off using *FX210,1 and on again using *FX210,0. If it's just the bleep that causes annoyance while programming this can be turned down. *FX212,224 will subdue the bleep, and *FX212,240 will make it barely audible.

When to stop

THE correct use of the statement STOP is in de-bugging programs. I hate its use to end a program and print out a pointless phrase telling me that it ended at a certain line. It can be placed in a program to stop the program so that a check can be made that it's functioning correctly up to that point. The variable values at that point can be found by asking the computer to print the variables. It's then often clear why a program doesn't function as expected.

It's usually possible to restart the program from that point if the position of the stop is chosen with care (ie, not in procedures or loops) by typing GOTO followed by the next line number after the STOP.

The listings demonstrating the Command Line Interpreter are to be found on yellow pages 101–102



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Precedent for pirates

Sir, In the October issue, Geoff Nairn reported on and Bill Penfold looked at the ubiquitous subject of software piracy. Could I, as a too-often bemused newish computer user and journalist/writer of long sitting comment on what I see as a part of a lobby to change the law to little effect?

Obviously, copying which stops people from buying is not good for the software houses, but they have only their own shortsighted policies to blame. Changes in the law will only make it illegal, not stop it.

In the case of much computer software, the potential market is being badly served because the early games inventors and publishers made a lot of big money when software was not so easily available. They also copied successful games, setting a precedent for others!

Today, too much software is available to tempt the addicts, who have an insatiable desire to have a copy of everything – but at £5 to £20 each, they cannot afford to keep buying these and acquire more hardware.

The other inescapable fact is that kids from eight to 80 take a delight in beating the system. In most cases, it's probably incidental that the copying saves money.

'Pirates' collect but seldom use the software over any length of time, not least because most of it is boring or rubbish, and is very expensive if one pays full price.

Of the three £8 plus games I bought for my son, none interested him for longer than three days. He's not yet six, and in a few years I doubt that anyone will be able to stop him being a 'pirate'.

Everything anyone has ever said about our schools producing illiterates and morons seems to apply fourfold to those who prepare the instruction manuals for anything to do with computers. Also, lack of knowledge of business and its needs is far too often apparent – but only after one has bought the product.

The *BBC User Guide* is a fine example of techno-speak, which increases as you get more involved. No other system seems any better, as I discovered when looking at a business system recommended to me by a consultant.

Without someone to help me with the 'simple' BBC B, I would have given up shortly after unwrapping everything, as my wife did. My son is coping through trial and error, the way all kids do. We now have a rather expensive, clever and quick typewriter!

Geoff Nairn and Bill Penfold rightly say that all is not well with software companies. However, what is wrong are the profit margins expected, combined with the unintelligible English which confuses the huge potential market.

Just compare the literature and ads of the computer industry with those being used to sell other high-tech items, even to specialists. The computer industry has to start using outsiders to show it how to communicate literately with its audience, and the sooner it does the better for everyone.

David Parkes Bristow
Middlesex

Passing parameters

Sir, I have recently purchased a *Basic ROM Advanced User Guide*, and on page 145 there is a list of Basic commands and their call addresses. The call address for SAVE is &BEF3. So to SAVE a program you could type:

```
A$="FILE".
CALL &BEF3, A$
```

Note, CALL &BEF3, "FILE" will not work but when I tried to execute other commands such as RUN, CLS and COS, I just got either 'syntax error' or 'no such variable'.

Presumably this is because of a lack of parameters, so I wonder if anyone might know how to pass parameters to the commands.

Simon Reading
Kent

The *Basic ROM User Guide* gives the entry points for each of Basic's commands as used by the Basic interpreter. It would indeed be possible to use these routines, provided all the necessary information was supplied in the correct block zero RAM locations. However, it would be virtually impossible to do this from Basic, as the program required to perform this would almost certainly corrupt the information you are assembling. The program would also be much longer than the command itself!

The only way in which these entry addresses can be used is from machine code, but again the relevant block zero RAM locations must be seeded with the expected information.

Making your mind up

Sir, I have just read your review of the six toolkits in the October issue of *Acorn User*.

I have used four of the ROMs mentioned, *Addcomm*, *Caretaker*, *Toolkit* and *Toolstar*. Without doubt in my experience *Caretaker* followed by *Toolkit* are by far the best. I have read another review of *Caretaker* which called it 'Another excellent example of a Basic toolkit ROM, certainly first division stuff'.

I would be very interested to read why Bruce Smith was disappointed with *Caretaker*. I have found its RENUMBER, SQUASH and EXCHANGE far out-rank any of the others. In general, I would like to see ROMs which have a few very good, well thought out commands, rather than many commands which are only half implemented (eg *Addcomm*). I would therefore conclude that your review is misleading and that other magazines (*Micro User* and *Which Micro & Software Review*) are far more detailed and accurate.

Ian Paton
London

Bruce Smith replies: First may I quote the last sentence of my review, 'At the end of the day, however, it should be a personal choice'. The idea behind the review, and the forthcoming series of comparative reviews, is that the prospective purchaser should be able to make up his or her *own* mind after being presented with a series of facts that the reviewer considers to be important features.

In the case of the toolkits, I drew up a table of those features I consider to be desirable, and manipulated them accordingly. As I mention in the article, I suggest that the reader does the same and you should be able to find the information necessary to do so in it. Thus I arrived at the combination that suited me best. Whether that matches your requirements is another matter.

Regarding other reviews. Most magazines tend to look at each item separately. Thus the reviewer may be rather blinkered and quite often may have never seen any comparable software.

If I provided each of six reviewers with one of the toolkits, I'm sure that every one would be highly recommended, as they are all good items of firmware. But this doesn't help the prospective purchaser to choose one from the six. if you don't have comparisons you can't form an accurate overview.

I therefore strongly challenge your comment that my review is misleading and inaccurate. Indeed, if you had only used one of the toolkits and not seen any others would you have written in to *Acorn User* with your comments?

Regarding my disappointment with *Caretaker*, I suggest you look at the article again as I do give my reasons there, but I'm glad the article succeeded in stimulating your letter.

No strings

Sir, The reply to Clive Maidment in the October issue missed one vital point; that (* ¦) can be used to start a comment line in an EXEC file, for example. The 'vertical bar' symbol, if it is the first non-blank character following the * symbol, causes the remaining string to be ignored. See *Advanced User Guide* p.12.

Dave Bell
Acorn Computers,
Cambridge

ASK a silly question, pass a fair comment, stage an angry protest – we don't mind what you write to us about (or about us!). Keep 'em short, keep 'em sweet, but keep 'em coming! The address is: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

The riddle of loading games

Sir, I have a number of games, including *Countdown to Doom* and *Castle of Riddles* and unfortunately, the quality of Acornsoft's tapes seems to be decreasing.

My copy of *Countdown to Doom* (a superb game) is of such a poor standard that it cannot be loaded unless it is connected to the hi-fi. I sent away for a new copy but that was also a 'dud'. So I now have two useless copies of the same game.

I realise that this may be due to the quality of our tape-recorder but if so why do old favourites such as *Snapper* still load?

Desmond Hourihane
Dublin

Acornsoft replies: We make every effort to ensure our products are duplicated to a high standard and have found that the quality of tapes and discs is improving all the time. The majority of cassettes that are returned to us work perfectly when we test them and we believe it is usually the tape recorder that is at fault.

However, if any Acornsoft customer thinks that they have a faulty disc or tape, they should approach their dealer in the first instance. In the event of difficulty they should send it to Vector Marketing, Denington Industrial Estate, London Road, Wellingborough, Northants NN8 2RL and it will be replaced free of charge.

Leftover chip

Sir, After buying my 6502 second processor I found that I had a spare DFS chip. I'd like to know if it's worth getting reprogrammed if it only holds 8k? Also how much is it worth and does anyone want it for a reasonable price?

D J Perry
Bristol

If you decide you have no further use for your DFS chip, then it certainly can be reused. To do this it must first be erased by subjecting it to ultra violet light which is damaging to eyes and so best done by using an EPROM eraser. It can then be reprogrammed using an EPROM programmer, either with your own sideways ROM software or programs in *ROM filing system format. You could certainly try selling your surplus DFS, perhaps through *Acorn User*'s free ads section. I would have thought that a price of £15 would make it a popular buy for our readers!

More on print problems

Sir, I am writing in reply to a letter from Mr. Keller that appeared in the October issue. I was interested to read that he had problems printing from *View* using the Silver Reed EX44 electronic typewriter with I/F 40 interface.

You were quite correct to inform him that the only real solution was to buy a data cassette recorder, but I feel that the problem is a little deeper than your answer would suggest.

First, if the writer had version A2.1 of *View*, then he would have no problem in printing files irrespective of type of cassette recorder. This version has a routine embedded in the ROM that enables the contents of the memory to be PRINTed, SCREENed or SHEETed by just typing in the keyword (in command mode) followed by RETURN.

Version A1.4, however, is not so well equipped. The ROM will work quite satisfactorily if the user has a disc drive or a data cassette recorder.

If neither of these facilities are available, then there is one last line of defence. Acornsoft supplied me with a copy of a fix routine, which when loaded into the computer's memory enables the user to PRINT, SCREEN and SHEET from memory.

As for the point about the printer driver for *View* and the Silver Reed EX44, I can state that the driver available for this printer does not alleviate the problem of printing files, and getting the Block? error message. The drivers that are available for the Silver Reed range of printers from Watford Electronics were written originally by myself, and the driver for the EX44 will only allow the user to access underlining of text. The range of drivers available, however, allow the user to access far more printing facilities with the more expensive printers.

Clive Brown
London

Latest round-up of games high scores

Aviator	Acornsoft	2,700	**D J Reynolds**
Android Attack	Computer Concepts	1,132,985	**Jon Button**
Arcadians	Acornsoft	48,760	**Gerard Mulholland***
Battletank	Superior	98,640	**Adrian Foster**
Chukkie Egg	A&F	7,739,440	**Richard Jolliffe**
Crazy Painter	Acornsoft	85,130	**Andrew Jenkins**
Cybertron Mission	Micro Power	68,000	**D J Perry**
Fortress	Pace	87,000	**Damon Futter***
Frak!	Aardvark	289,300	**Jon Button**
Free Fall	Acornsoft	1,989	**Jon Button**
Hopper	Acornsoft	42,375	**Stephen Corcoran**
JCB Digger	Acornsoft	52,000	**Owain Griffiths***
Killer Gorilla	Micro Power	108,250	**David Sowerbutts**
Meteors	Acornsoft	73,220	**Robert Hirskyj***
Missile Command	Gemini	34,810	**Keith Harding**
Monsters	Acornsoft	257,060	**Ian Cook**
Moonraider	Micro Power	583,750	**Lindsey Tasker**
Overdrive (BBC)	Superior	102,560	**Daryl McClure***
Overdrive (Electron)	Superior	707,010	**Gerard Mulholland***
Painter	A&F	116,350	**Stephen Corcoran**
Pengo	Watford	173,000	**Damon Futter***
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** Scores unbeaten since October*

Handicapped kids appeal

Sir, I am appealing on behalf of the St George's Hospital Development Centre, for some help from your readers.

Our Centre provides an assessment and treatment service for children with all kinds of handicap. Recently we acquired a BBC micro, with monitor, dual disc drive, printer, concept keyboard, turtle and a small amount of software. Our aim is to develop suitable computer activities for very young physically handicapped children. Most of the software currently available is for the five year old and over age range.

We think some of your readers may already have written programs to amuse their own very young, normal children, and these might be adapted to suit our handicapped youngsters. As an example, we have devised a very simple sequence in which each touch of the concept keyboard adds a brick to a pile (with sound effects) and the final touch brings it crashing down.

In effect, we are thinking of a computer 'toy box' for the child whose disability prevents him from playing with ordinary toys for toddlers.

If any of your readers would like to (a) lend us any suitable programs or (b) write programs to our specification (for which we may be able to pay a small fee), would they please write to me at the address below.

Dr David Hall
St George's Hospital Medical School,
Cranmer Terrace,
London
SW17 0RE

page 61 ▶

On/off dilemma

Sir, In Hints & Tips in the September issue, Martin Phillips discussed the wisdom of leaving a BBC micro switched on for 10 hours. After 30-odd years using electronic gadgetry, I have learned that the most harmful thing you can do to a piece of apparatus is to switch it on, and the only way you can avoid this is never to switch it off.

I believe that the damage is caused by the power surge through the electronics before the self regulating devices can take control, and even resistors need to warm up to reach their working resistance.

Thus while I agree with him that overheating can be very damaging, there's a lot of sense in Mr Smith's practice of leaving the computer on for 10 hours, rather than switching it on and off several times. I also agree that in the interests of fire safety such equipment should be switched off overnight; indeed, it should be switched off and *unplugged* whenever the house or office is vacated for more than an hour.

Turning to the subject of the BBC micro power supply, I have experienced problems with overheating and, above all, low voltages.

I have often seen recommendations in the press (including *Acorn User*) that owners should return their micros to Acorn with what appear to be RAM or ULA problems with symptoms such as odd pixels lit up on the screen or failure to erase fully the graphics during the playing of some of the arcade type games. When I had this problem I found that it was due to a low voltage in the RAM area of the BBC board. The voltage was falling to about 4.8 when the machine was hot. Taking the lid off the Beeb allowed it to cool down and the volts rose to about 4.9. The problem occurred only when my room temperature was over 70°F.

To keep the Beeb as cool as possible sideways RAM expansion should, as far as practicable, be kept outside the Beeb to permit maximum air circulation. This is particularly necessary because the accumulation of plugs and cables under the Beeb which one gets with disc, printer, teletext and second processors also appears to reduce the free flow of air through it.

This view appears to be in line with Acorn policy. It's a pity they don't produce a sideways RAM/ROM board that meets their criteria for expansion.

Dennis V Long
Kent

Dave Bell of Acorn replies: You cannot generalise about the effects of frequent switching or a prolonged ON state on electronic equipment. It depends upon the component content, design techniques, etc. It should make little difference to the BBC micro whether it is left on or switched on and off frequently.

The Beeb is designed to work in ambient temperatures of up to 35°C with the specified options. Items fitted inside the case like a sideways ROM card may affect this specification, apart from possibly violating internal data & address bus loading rules. In many situations a particular add-on may function well, but we are reluctant to sell an item such as a sideways ROM card which may degrade the BBC micro's specification. Individuals with technical skill may, of course, find ways round a problem but it must be at their risk.

Modern half-height disc drives generally have low enough power consumption for the BBC micro to provide adequate power for one and in some cases two drives. An extra PSU should only be necessary here if internal add-ons have been fitted.

Parisian plea

Sir, I am a new user of the Electron and reader of *Acorn User*. The Electron has not been available in France for very long and there are no magazines or even articles about it in the French press.

I had the good luck to find your magazine in an English book shop in Paris, where I also found some good programming books for the Electron. Before that I only had my *User Guide*.

I wish to make contact with other Electron users, but the user groups in your list are mainly in Great Britain. So if any readers know of a user group in France, particularly Paris, please let me know – I'd like to hear from any French Electron users anyway.

Cecile Christophe
12, rue Tissot,
92210 Saint-Cloud,
France

Type to print

Sir, I use a BBC model B with an Epson RX80FT printer for word processing. This arrangement works well, but I miss the beautiful quality printing from my old IBM model 82 golfball electro-mechanical typewriter.

Obviously, I could buy an expensive modern typewriter, but I only need one quality final version, and the Epson satisfies my draft needs.

Ideally, I would like to convert my IBM model 82 to drive it through an interface running from the RS232C port. Can any readers assist with a technical handbook for this typewriter, and any suggestions on conversion? Guidance on solving the interface requirement would also be appreciated.

Sam Burgess
34 Redcliffe Road
London SW10

Why, why, why?

Sir, Yes, I have tried typing the command 'Daytona' in on *View* as suggested in the October Acorn Abuser's Diary – and I'm not in the slightest bit amused. Instead of faffing around with such narcissistic nonsense I'd rather Acorn had got some of the irritating bugs out of their £50 plus product before releasing it.

Why, for instance does SAVE :2.A.FILNAME not do what it says, but overwrites your source file instead? Why does LOAD :2.A.FILNAME result in a syntax error message? Why does CHANGE Jon John also change jon to john, joN to john and JOn to JOHN, etc? Why does the screen clear every time you do a LOAD or SAVE? Why if you invoke a bad command does the filename disappear off the screen? Why does *HELP DISC come up with message VIEW A1.4, instead of Disc Doctor's help info? Why do Acorn ignore requests to rectify these faults in their expensive product?

James Miller
Cambs

Getting it taped

Sir, I must challenge Martin Phillips' statement that, 'When used with a computer, the cassette is pushed to the limit of its performance'. This is certainly not true and I am successfully using a 20-year-old Philips machine – the joystick type – which I would not consider for audio work.

When recording music, the cassette has to cope with very wide frequency and dynamic ranges. It must also have a low signal to noise ratio and low distortion figures, including wow and flutter.

For data, the cassette only needs to deal with two frequencies (representing 0 and 1), and the dynamic range is nil. Furthermore, on playback the computer only has to differentiate between tones above and below a single mid frequency, so it can tolerate variations in tape speed and a level of background noise which would be unacceptable for music.

Incidentally, there is no reason why noise reduction systems cannot be used with computers. In fact, because the dynamic range of the signal is zero, most noise reduction systems will make no difference whatsoever.

There is no point in using anything other than standard grade type 1 (ferric) cassettes – but stick to reputable brands. Some computer dealers sell black unlabelled cassettes of varying lengths at reasonable prices. These are usually loaded with Agfa or BASF tape and are quite satisfactory.

Don't pay over the odds for specially packaged 'computer' cassettes.

There is no reason why an old open reel recorder should not be used for data recording. Its big advantage is that you can splice lengths of coloured leader tape in between your programs to make finding them easier, and you can move programs from one reel to another, or delete them and reuse the tape. One word of warning though – unless you're very good at editing don't record over splices.

Richard Porter
Publications Editor
The Federation of British Tape Recordists

page 63 ▶

Sorting out

Sir, With reference to George Hill's article 'See how they sort', *Acorn User*, October, shell sort is more efficient than bubble sort because comparison and exchange at a distance allow items in an unsorted sequence to take longer 'jumps' towards their eventual destination – a small value at the end of the list does not have to work its way laboriously back to the beginning, one step at a time.

But to get the best mileage out of shell sort the distance for comparison and exchange should *never* be allowed to become a power of two. So the worst possible example to give the unsuspecting reader is an array of 16 members where the items are compared at distances of 8,4,2 etc. Why? Because it has the effect of partitioning the data into discrete sets which are ordered within themselves but will not interact with one another until right at the end.

Take the most pathological example: a set of 128 numbers, 1,65,2,66,3,67, etc. It's easy to see that comparison at distances of 64,32,16 and so on will do nothing for us, and that not until next-door neighbours are compared will any useful exchanges take place.

Even worse than the bubble sort!

The best initial distance to choose is one less than the power of two nearest to half the number of items – this ensures that each item meets as many others as possible, and that most of the work is done by the time the comparison distance reduces to 1. Replace line 510 of the 'unadorned' program listing with:

```
inc=1:REPEAT
inc=inc  *2  :  UNTIL
inc>max
inc=inc DIV 4 - 1
```

I liked the recursive tree sort – very neat!

Susan Jones
City University
London

George Hill replies: I agree with what you say and make the following pleas in mitigation:
a) The programs were written to illustrate sorting methods to students of 'A' level standard and below, and were therefore shorn of complications where possible.

The sort seemed to work very well, so I did not worry too much about the 'worst case' you describe.
b) Both the text books I consulted (*Data Structures and Algorithms* by Aho Hopcroft and Ullman, and *Introduction to Data Structures* by Beidler) produce precisely the same algorithm as mine and don't mention the problem you raise.

Just my luck to choose the worst possible case by accident!

Using the change you suggest the time taken for shell to sort 128 names was reduced from 16.75 secs to 12.77 secs. This would indicate that quick and tree sorts should not be considered until the number of items to sort is in excess of 200.

Wordprint lapse

Sir, Thank you for publishing my *Wordprint* program in your October issue.

Unfortunately because of the time-lapse between the original submission and my supplying a new cassette a small error has occured. The program was amended and no copies of the original were available.

On page 148, the paragraph which starts in the centre column gives three addresses, #2B57, #2B69 and #298A. These should be #2B51, #2B63 and #2984 as shown in the program (lines 505, 316, 20, 22).

Should any reader need help then I would be pleased to assist them.

Alex Wilson
Essex

Amstrad abuse

Sir, Your scholarly and highly appreciative evaluation of Amstrad's Hi-Fi technology (Acorn Abuser's Diary, October 1984) left us not knowing whether to laugh or cry – not least because the unit featured in the photograph was not ours, but one produced by a competitor.

A M Sugar
Chairman
Amstrad Consumer
Electronics plc

Kitty spends a reader's money and explains an error message



Q I read your answer to Bernard Walker's question in the November issue of *Acorn User* with interest. I have also experienced problems when typing in listings, but often when I run the program I get the error message 'No room', rather than 'Bad Mode'.

Could you explain why this occurs?

Ray Harris
Kendal

A The 'No room' error message is issued by the Beeb or Electron when it trys to execute the program. A computer requires space to perform its housekeeping. For example, variable names and the values assigned to them must be placed above the program, and space made for arrays to be stored and calculations performed.

If, on running, the Beeb or Electron finds it doesn't have enough room for these it issues the 'No room' message. Before tearing your hair out in a frustrated rage, reset the Beeb by pressing the CTRL and BREAK keys together. Now type OLD and re-run your program.

This often does the trick – if it doesn't, check you have entered the program at the correct value of PAGE. For example, the program may have been written by a tape user, who expects PAGE to be set at &E00, whereas you are a disc user who works with PAGE at &1900. To test this out, save your program to cassette, then type:

```
*TAPE
PAGE=&E00
NEW
```

and reload the program and try again.

If all else fails, try deleting any surplus spaces (for example between line numbers and the start of the program text), and remove all REMs and compact lines into multi-statement lines. Removing a line number from a program saves four bytes immediately!

Q Could you please give me some advice on what to buy next? I am 16 years old and halfway through a computer studies course. I am really stuck on what to spend my money on. First I had my heart set on a 100k Cumana disc drive, then it was a number of ROMs and now it is a Brother Printer and a sound/speech synthesiser.

Paul Gallagher
Belfast

A When you only have a bare Beeb and a cassette recorder, everything you don't have seems wonderful.

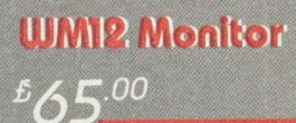
A printer would probably keep you enthralled for a couple of weeks, but unless you write a lot of letters, it would more than likely sit unused after the initial love-affair. Likewise, the ROMs. You could certainly buy a wordprocessing ROM but unless you have discs it would try your patience to use it. Good utilities (such as *Disc Doctor* and *Caretaker*) would be virtually useless without discs. Speech synthesiser? I doubt if you would be using it much after a month or so.

Now – discs. I think this is what you should go for. Not only does a disc drive mean an end to eternal waiting for cassettes to load, allowing more a time for programming, it also allows you to investigate and experiment with the more serious aspects of programming such as writing and updating databases, personal address books and accounts.

So, my advice? Even though it's the most expensive (disc interface *plus* drives) I'd go for discs every time. Once you have them, you can then start wondering what to buy next. For me it would be the printer . . .

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The MEP barcode reader in action. It has great potential in education

BARCODE BREAKOUT



You don't have to serve the life sentence of typing in programs. George Hill shows the escape route

HAVE you noticed that beer cans and baked bean tins have strange black-and-white stripes printed in a small panel on their labels? These are barcodes, and they seem to be everywhere. It's only a matter of time before even 17th-century music, sheep and dogs are marked in this way, with Bach-codes, baa-codes and bark-codes. But enough of this punnery! Barcodes are an important commercial development which has already had an important effect on monitoring the distribution of consumer goods and packaged food and is likely to affect employment levels and patterns in the grocery industry.

Where else do barcodes crop up? Perhaps the second most common use is in libraries. Barcode technology allows the computerisation of the whole process of borrowing and returning books. It gives the librarian all the advantages of computerised file handling, so that he/she can deal with stock control, overdue books, borrowing from other branches and other administrative details simply and accurately, without the massive card indexes so common in the past.

A number of *machine readable* code systems are in current commercial use and the most common now are magnetic. Magnetic media such as tape and disc backing storage and magnetic strips on credit and bank cards, are machine readable but not normally human readable. Machine readable information can, however, be read by humans – for example, the magnetic ink markings at the foot of cheques are easily recognised stylised numbers and letters. Punched cards and punched paper tape are also human readable, though requiring a lot of practice. Barcodes fall into this category too. Humans *can* read them, but it takes experience and they are not primarily designed to be scanned by human eyes.

Until now barcode readers have been very costly, and hence only used in commercial situations where the expense of investing in the system can


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Welcome

HOW THE BARCODE READER WORKS

THE MEP reader is covered by a patent, so precise electronic details are not available. In any case the construction of such an instrument involves precision work which puts it far beyond the capabilities of all but the best equipped and most skilled amateur. The principle is as follows:

1. A special transistor in the reader emits infra-red light which is conducted down an 'optical fibre' (a very fine strand of glass) into a small chamber (figure 1) just above the paper surface. This is the source.
2. White paper reflects the light from the source, while black paper absorbs it. A second optical fibre is sealed into the chamber and any reflected light passes up this fibre.
3. The other end of the second fibre is connected to a light-sensitive device that emits a small current if light falls on it.
4. This small current is amplified and converted into an output voltage that passes along one wire of a cable to the user port.
5. The software now samples the voltage on this wire. While there is a voltage, light is being reflected – corresponding to white paper. No voltage indicates a black bar.
6. These signals are read as 0 or 1 by the computer, and the length of time the signal remains constant can be used to determine the width of the bar.

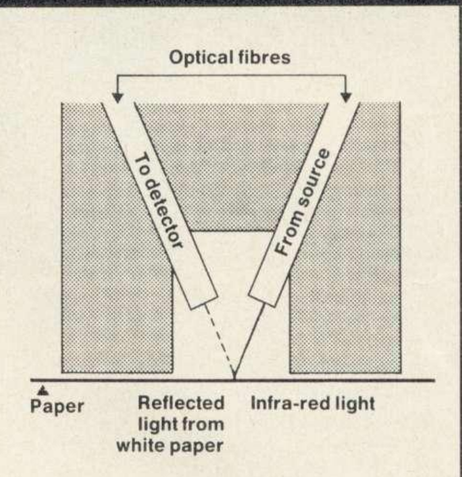


Figure 1.

be recouped by the effects of improved efficiency. The software (programs) written for them have all been of a very specific commercial nature, and hence not of great value for teaching or hobby purposes. But all this should change with the availability of an inexpensive barcode reader produced by the Microelectronics Education Programme and packaged by Addison-Wesley Publishers (see box on page 70).

The MEP package, containing reader pen itself, a user guide and several useful and instructive example programs, brings barcodes within the scope of the amateur home micro user. It will retail for under £50.

The software in the package to be launched this month is designed to work with the BBC micro but there will eventually be versions to run on the RML 480Z and the Sinclair Spectrum to cater for the other DOI-supported micros. Small businesses may also find it a useful adjunct to their operations as barcodes become universally used on products and more sophisticated and customised software is written.

Barcodes can be used to encode any information that is essentially digital. ASCII text is a simple example, but a Basic program is also digital in nature, consisting of both ASCII letters and numbers and 'tokens' for keywords, with beginning and end-of-line markers.

Two standard systems of coding are covered in detail in the MEP barcode pack: the European Article Numbering code, of which more later, and the Telepen data code. It is the latter system, allowing the encoding and decoding of Basic programs, that will be of interest to the home micro user. Apart from the listing published in last month's yellow pages in Telepen coding, *Acorn User* printed a sample line in Telepen code as a teaser in the March issue. Several readers were able to decode it but if you weren't among them you can discover the message in figure 2.

A third system is introduced in the MEP pack in which binary digits are encoded directly into barcode form. This gives a good idea of how information is digitised and then converted into barcode, and offers practical experience of the binary and hexadecimal systems. Thus it is a teaching aid that can be used at various levels.

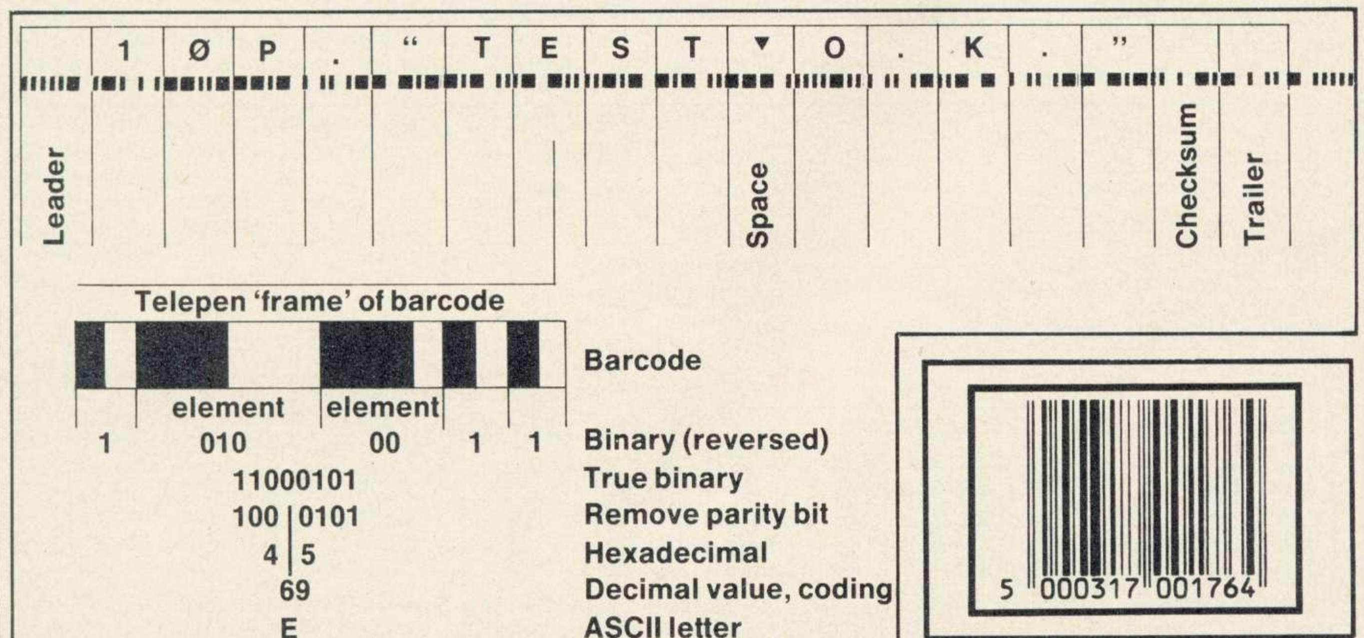


Figure 2. Translation of bar-code (Telepen system) line printed in the March issue

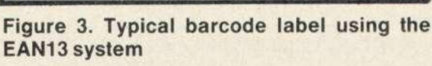


Figure 3. Typical barcode label using the EAN13 system



ADDISON-WESLEY PUBLISHERS

NEW EDUCATIONAL SOFTWARE

The Bar Code Reader Project Teaching Pack

Published by Addison-Wesley for the Microelectronics Education Programme



The Bar Code Reader Teaching pack: is an exciting and innovative teaching resource for schools and colleges (see review in this magazine). It provides additional material for any course covering information technology and will be of particular interest to those running TVEI courses.

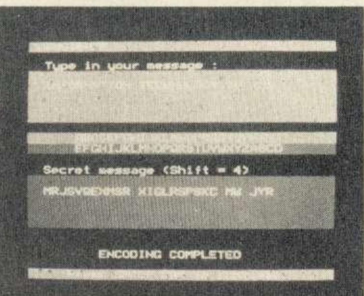
The aims of the project are to:

- provide a supplementary input system for the microcomputer
- introduce students to the applications of bar code readers
- provide a tool for specific applications.

The project is available as a cassette or 40 track disk pack retailing at £49.95. A home-user pack will be available in early 1985.

The Information Technology Project

Project Director: Trisha Strong
An MEP/CET Project
Published by Addison-Wesley



The Information Technology Project provides a complete course in information technology based on the work pioneered by Croydon IT Unit suitable for pupils aged 11 to 14 years old. The first stage covers the following topics.

- Introducing information
- Information skills
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Each Teaching Pack contains:

- Two disks or three cassettes
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- One teacher's guide covering the whole of stage 1.

Additional pupils' books are available separately in packs of five retailing at £15.95 per pack.

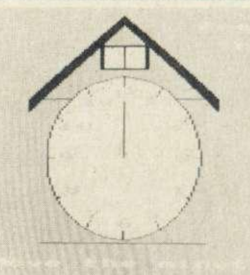
The cassette teaching pack retails at £39.95 and the disk pack at £49.95.

The project is also available for the RML 380Z/Link-480Z (single density disk)..

Maths For Micros

Project Director: Ruth Walker

Consultant: Arnold Howell



Maths For Micros has been developed by members of the distinguished Mathematics for Schools author team and a group of professional programmers. All the material has been extensively trialled in schools. **Maths For Micros** material can be used alongside any primary mathematics scheme as it covers the basic strands of primary mathematics:

- Number • Measurement • Shape • Pattern • Relations
- Pictorial Representation

The pupils' book provided with each set of programs offers pre-computer activities, instructions for using the programs and follow-up problems and investigations.

The teacher's guide contains hints on classroom organisation, a detailed description of each program, black-line masters for work and record sheets, and technical specifications.

Each cassette pack retails at £21.95, disk pack at £29.95 and additional pack of 5 pupils' books at £15.95.

The prices quoted above are valid for the UK and Eire only and are exclusive of VAT.

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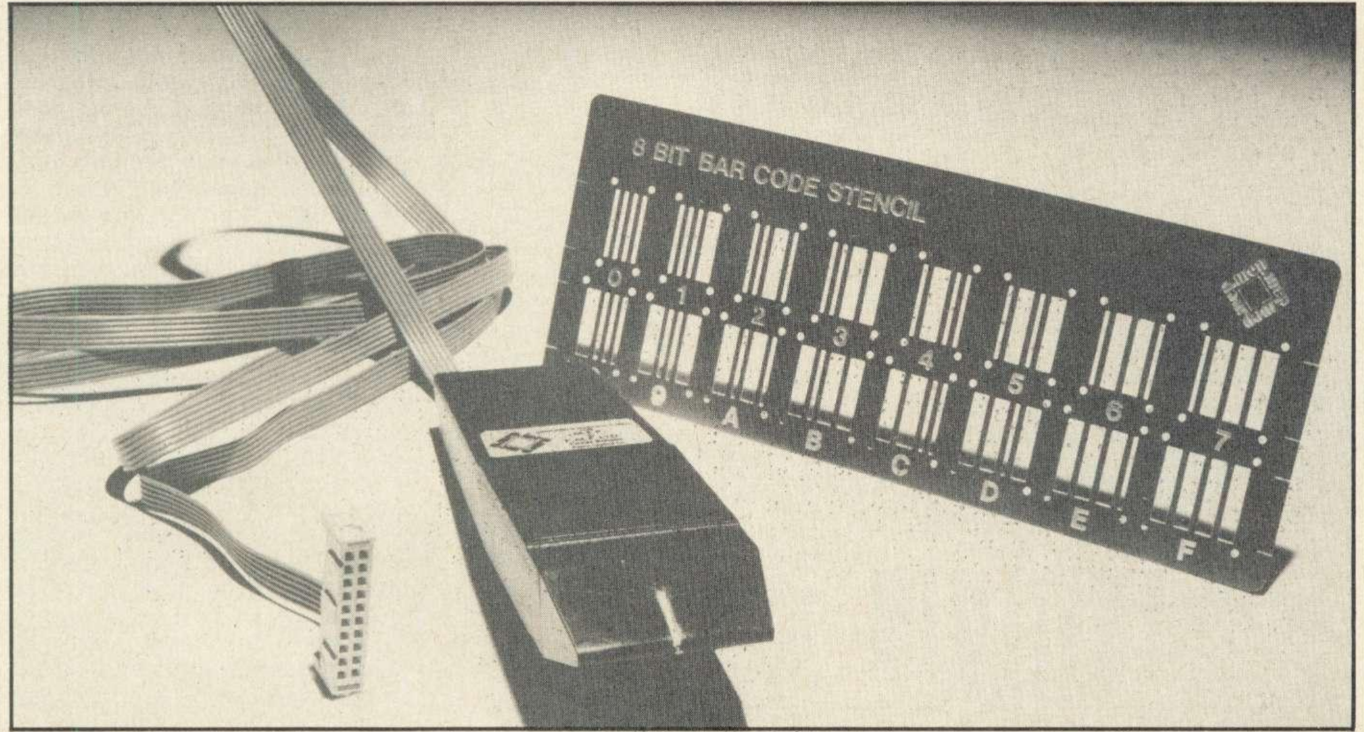
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AU/Sch/DEC



From the pack supplied by Addison-Wesley, the barcode reader with cable and user port plug, and the metal stencil

Telepen system

Details of the Telepen system are fully explained in the MEP package. For our purposes they can be summarised into three main features:

- The code for each letter takes up the same amount of space (called a 'frame'), giving the possibility of constant-length lines.
- Each line is started and ended by a unique 'guard pattern'; in figure 2 these are the 'leader' and 'trailer' frames.
- A checksum is used to ensure that a valid 'read' has taken place.

These features mean that the codes can be reliably read by the barcode reader, and so copying a Basic program from a magazine can be reduced to a simple and quick mechanical process, requiring no ability to type. The reader pen is simply drawn across the row of stripes against a supporting straight-edge. The method is obviously free from the hazard and expense of tape or disc transfer through the post, and permits a convenient and inexpensive means of publishing listings.

As demand grows *Acorn User* will be presenting programs in barcode format (as well as in the conventional way), and Addison-Wesley also intends to publish versions of its computer books in which the programs appear in barcode form for easy copying. Other publishers are sure to follow.

The MEP pack includes a utility program to enable users to produce their own hard copy barcode versions of programs to be output on a suitable dot-matrix or daisywheel printer.

EAN system

Educational use will be two-fold. First is the simulation of 'point-of-sale' (POS) transactions, and the other is in the use of barcodes to encode binary numbers directly by a system worked out by the MEP.

The POS application uses the EAN system (apologies for all these abbreviations – computing is riddled with them!). You might have guessed that the EAN system is very complex. Thirteen-digit codes are used (EAN-13), and an example appears in figure 3. Other versions such as the EAN-8 code exist but these are of much more restricted use.

To give you a flavour of how the system works, here are a couple of quotes from the MEP pack:

The EAN-13 system represents 13 decimal digits in barcode form. The code for the 13 digits is carried in two 'fields'.

The barcode is started by a 'guard pattern' of three narrow bars, two black one white. Then comes the code for the first field.

The fields are separated by another guard pattern.

The code for the second field comes next.

The code is terminated by another guard pattern.

The first field is made up of patterns from sets A and B, while the second field is made up of patterns from set C.

The last digit is a checksum.

The checksum digit is calculated by a complex algorithm. To follow it we need to number the 13 digits from left to right as digits 1 to 13. Thus the UK's digits 50 are digits 1 and 2 respectively. During the calculation of the checksum the checksum digit (number 13) is not used!

Step 1) Add together digits 2,4,6,8,10 and 12 and multiply the result by 3.

Step 2) Add together digits 1,3,5,7,9 and 11.

Step 3) Add together the results of steps 1) and 2).

Step 4) Take the final decimal digit only of this sum, and subtract it from 10. The result is the checksum.

Following this calculation for the EAN number 50-00127-06109-C (where C is the missing checksum). *page 70* ▶

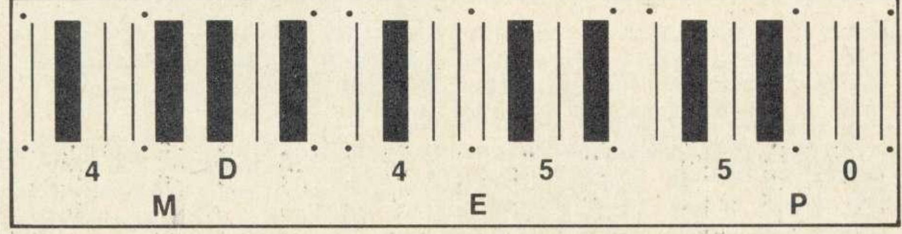


Figure 4. Piece of ASCII coded text in barcode drawn up from stencil

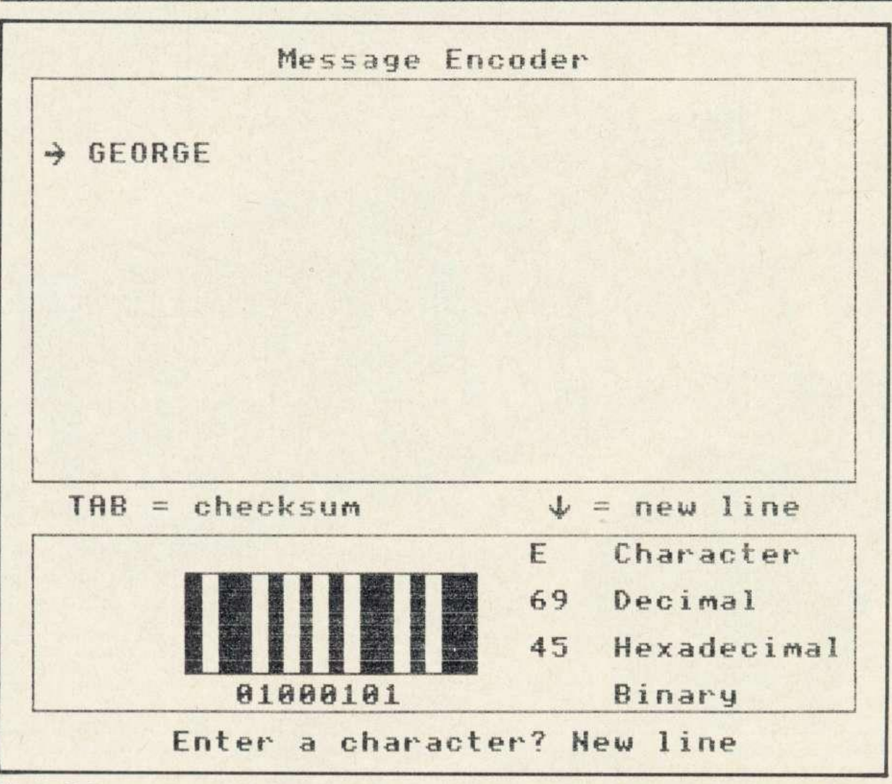


Figure 5. Screen dump of the menu-driven binary encoding/decoding system in operation

◄ page 69

1) (0+0+2+0+1+9) × 3=12 × 3=36
2) (5+0+1+7+6+0)=19
3) 36+19=55
4) 10−5=5=C
The fully encoded number is thus 50-00127-06109-5

Confused? Never mind, understanding the coding is not necessary to the successful use of the system. Every product has a unique code which is read by simply brushing the barcode reader across it. The software takes care of the rest. Several procedures are thus possible:

- Decoding the bars to find out the product's country of origin.
- Decoding of bars and storage of the information thus revealed, together with details typed in (name of product, price, weight etc).
- Saving this stored information in a tape or disc file.
- Loading a file from tape or disc.
- Reading of codes and producing of a running total price for articles whose details have been loaded in from file. This is the true POS simulation.

I have used the package in the classroom and it provoked considerable interest and discussion from a group of students on a Manpower Services Commission engineering course.

Encoding binary

The binary encoding and decoding system is based around a simple principle. A broad bar represents a binary 1, while a narrow bar represents a 0. The bars here are much larger than commercial ones, as they are designed to be human-readable as well as machine readable. They can be drawn in pencil using the stencil illustrated in figure 4 which comes as part of the pack. Two programs are provided to deal with these codes: a comprehensive ASCII message encoding and decoding system and a music system.

In the first, the program can be used to convert characters typed at the keyboard into ASCII, decimal, hex and binary. Figure 5 shows a screen dump of the system in operation. The stencil can now be used to reproduce the message on paper, and it can be decoded by another pupil with the barcode reader. This is fun in computer literacy classes, and the instructive element can be increased by denying the code-writer access to the program, thus forcing the deciphering of ASCII tables and the conversion of decimal to hex and binary, and the calculation of a simple checksum.

The music encoding and decoding system was originated by Joe Telford. It illustrates the way in which musical phrases can be put together in a jigsaw-like fashion to form tunes. For pupils with a higher level of musical interest and competence it shows how musical notes can be broken into pitch and length parameters and digitised. The very skilful might construct their own tunes with the stencil.

A further application in the pack is a simple picture digitiser. The barcode reader scans the picture, timing the relative widths of black and white bands, and displays the result. In this mode it is clearly necessary to have a very accurate and steady scanning speed. Scope here for a project on mechanising the process!

The user obviously needs to build up his/her manual dexterity in wielding the reader, and a program that graphs the steadiness (or otherwise) of your scanning is provided.

The MEP pack manual gives running instructions for all the programs, detailed explanations of types of coding in appendices, and suggestions for classroom exercises.

I am convinced of the applicability of this package at all levels of computer teaching, and also in commercial courses. The range of applications extends from the lowest level of introduction to computers (where it can be used by the very young to read messages or tunes) to Advanced level or beyond, where it could form the basis of an extended project. Two suggestions that have already been made are to encode and machine-read names and classes for a computer timetabling program, and to implement a library checkout system. There is something here of interest to everyone.

SUPPLIER

The MEP barcode reader is available as a Teaching Package aimed at educational establishments direct from Addison-Wesley Publishers at £49.95. – and see page 113 for special offer to ALL readers.

This pack, contained in a moulded plastic bag, comprises:

1. **Metric Crown Quarto user manual with worksheets, etc.**
2. **An acetate sheet to protect barcode program sheets and the reader itself.**
3. **A stencil.**
4. **The barcode reader.**
5. **Software on cassette or disc.**

Contact Marketing Services, Addison-Wesley Publishers, Finchampstead Road, Wokingham, Berkshire RG11 2NZ, tel: (0734) 794000.

A simplified version for the home user/hobbyist with instruction notes rather than a full manual will be obtainable early in 1985, but details of availability have not yet been finalised.

Trial-run programs for owners of the reader are on pages 97 and 98. You could join the club – see competition on page 89

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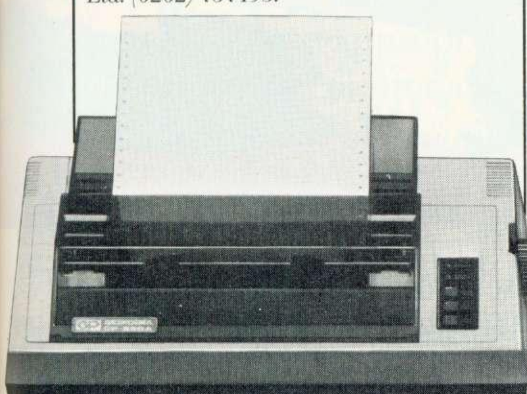
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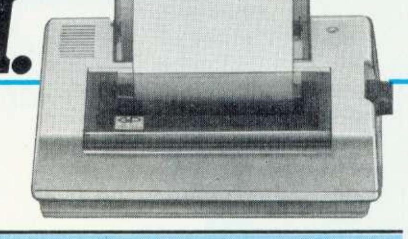
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LANCASHIRE *Burnley: IMO Computer Centre. (0282) 57411/54299.*
Lancaster: Castle Computers. (0524) 61133.
LONDON *W.1: Specialist Computer Centre Ltd. 01-935 4150.*
Eltham: The Advanced Technology Centre. 01-859 7696.
LINCOLNSHIRE *Grantham: Oakleaf Computers. (0476) 76994.*
MANCHESTER *Sumlock Electronics Services Ltd. 061-834 4233.*
MERSEYSIDE *Liverpool: Specialist Computer Centre Ltd. 051-236 3499.*
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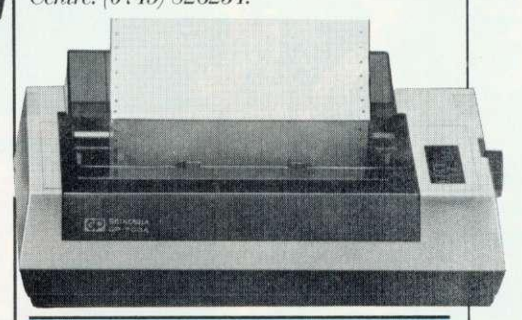
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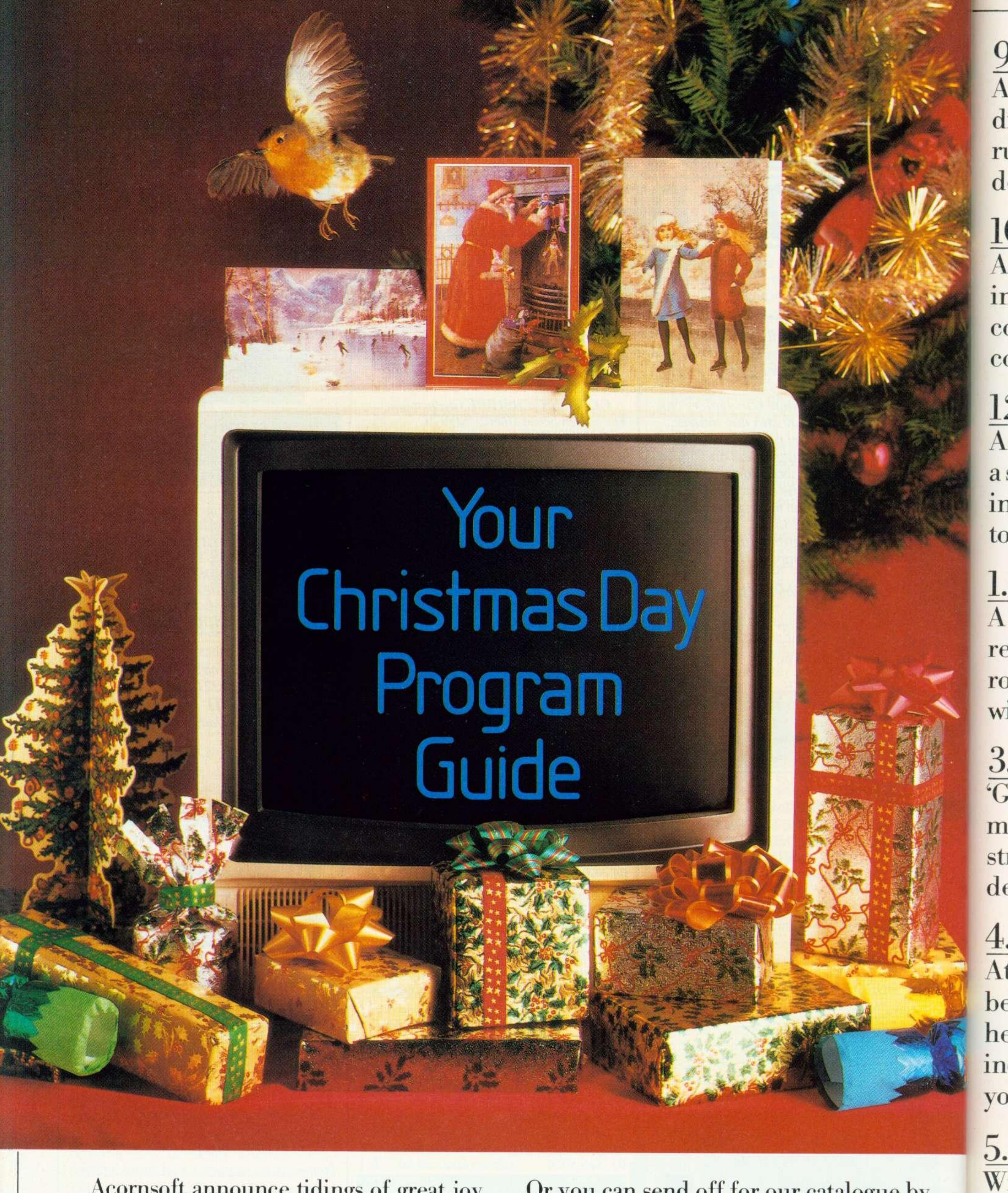
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Each one makes an ideal stocking filler.

They're all available at your local Acornsoft stockist. For the address or to order by credit card simply ring 0933 79300.

Or you can send off for our catalogue by writing to Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL.

Alternatively, however, you could always take a chance and drop a line to Father Christmas.

ACORNSOFT

Software for the BBC Micro and Electron

9.00 Firebug

A fast moving arcade-type game in which you are a fireman, trying to rescue some oil drums and take them to the safety of a water tank. Your opponent is the firebug who runs around lighting fires which move slowly towards the drums and fire extinguishers, destroying them if contact is made.

10.00 Maze

A gripping graphics game where you enter a top secret installation with the aim of stealing secrets from a rival company. The security system, however, has many levels each consisting of a maze of corridors patrolled by armed robot guards. Complete with full colour 3-D graphics, sound effects and a high score table.

12.00 Elite

A superb 3-dimensional graphics game that's light years ahead of any other. You are a space trader who roams the universe, making your living from buying and selling cargo in your Cobra space craft. On your travels, you will encounter aggressors who are eager to put an end to your dealings. Be warned, only the fittest will survive.

1.00 Crazy Tracer

A crazy adventure in which you guide a paint roller round the edge of a maze of rectangles, while avoiding the monsters which are trying to stop you by crushing the roller. Beware – as the game progresses, so the number of monsters chasing you will increase.

3.00 Go

'Go' is a board game for two players which originated in China 3000 years ago and is now more popular than Chess in the Far East. It requires strategic insight, intuition and a strong, calculating mind. If you wish, you can also challenge the computer at differing degrees of difficulty. A velly good game indeed.

4.00 Watch Your Weight

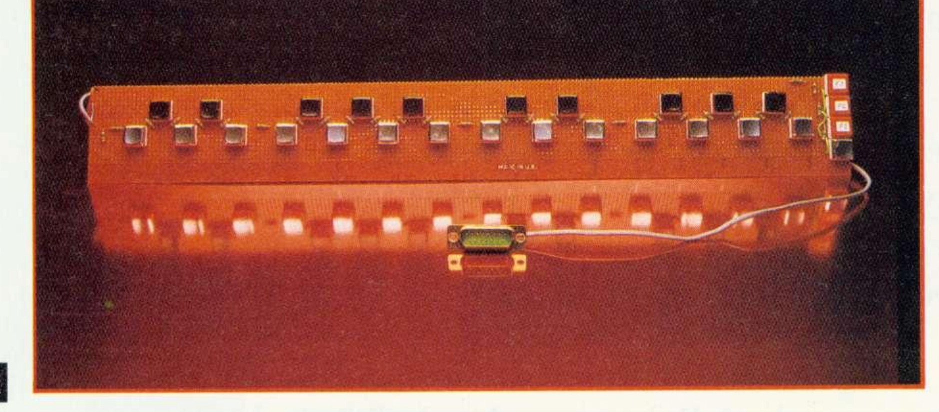
At last, a weight-loss program designed especially for you. With it, your computer becomes an expert wholly conversant with and sympathetic to your needs, and will help you choose an appropriate and individual weight-loss plan. The program also includes a calorie counter and a series of apposite menu suggestions to help stimulate your imagination when you just can't think what to eat.

5.00 The Complete Cocktail Maker

With everything from a Black Russian to a Betsy Ross, this program contains data sufficient to concoct a staggering 320 different cocktails.

6.00 Paul Daniels' Magic Show

Stun and amaze your friends with your astounding feats of magic. This program contains ten tricks to be performed by or with your BBC Micro/Electron. Hurry though – it's bound to disappear fast.



Joe Telford shows you how to build your own keyboard for a song. Get organised now!

ORGMENTATION

WITH Christmas approaching, Santa's elves (Elf Research Department) have been working furiously in collaboration with *Acorn User* to provide a really interesting present for Mum, Dad or the kids – the Acorn User Monophonic ORGan, or Acumorg.

The seasonal advice from snowbound Telford Towers (remember Cleverland is north of the Arctic Circle – Ed) is to buy the parts for Christmas, then, after the festivities have died down, allocate a few evenings to putting Acumorg together. Users of upper secondary age should be able to manage with little help, but parents should assist wherever possible, especially as a soldering iron is needed.

Acumorg provides a cheap and simple way of attaching a logical music keyboard to the BBC computer. The package presented includes both hardware and software. If there is sufficient interest, a further article on learning programs for it will be published. A small amount of software calibration may be required for some BBC micros, but in my experience this has never taken more than 10 minutes, and once calibrated, the programs seem to function permanently.

The Acumorg has 28 keys, and is designed to cover two octaves by direct keypress, and has three user-controllable function keys. Because the hardware produces 28 separate digits via ADVAL 1, the keyboard can be completely controlled from Basic. It's connected to the BBC micro by a three-wire lead, which may be over a metre long.

All Acumorg functions other than keypresses are produced by software. It should be operational in real-time, so that musical intervals down to semiquavers can be played accurately. Facilities to be made available initially include: real-time organ sound, data-logging (music writing facility), selectable octaves, volume control, major and minor chords, and a tune record/playback facility.

These are available from a selection of programs described at the end of this article. Each facility within a program will be activated by a function key on Acumorg.

The components (see panel) can be bought from almost any high street electronics store. (No pin photodiodes are included, so problems should be minimal.) The version built here was constructed using components obtained direct from RS Components which doesn't deal direct with the public, but your store may be able to order for you.

The minimum tools needed for this project are:

- soldering iron – miniature 15 Watt type with a $\frac{1}{16}$ in bit.
- small side clippers.
- small screwdriver (for 'D' cover).
- scissors (for cutting labels for keytops).

Messy solderers may find a desoldering gun or desoldering braid useful.

Potential dividers

Figure 1 shows an electronic circuit called a potential divider, so called because the two resistors, R_1 and R_2, divide the electrical potential or voltage, so that the input to channel 1 (ch.1) is somewhere between 0v and Vref. The actual value of this input voltage depends on the two resistors, and can be found by applying the formula:

$$V_{in} = \frac{R_2 * Vref}{(R_2 + R_1)}$$

This says the voltage at V_{in} is the result of Vref being shared in the ratio R_1 to R_2. We can find this value by writing a small routine:

```
  10 REPEAT PRINT FNadc(1):
     UNTIL FALSE
1000 DEF FNadc(x) = ADVAL(x) DIV
     128
```

Notice that the analogue input is divided by 128 to make it more stable, giving a number in the range 0 to 511.

It's possible to connect this divided voltage to the computer by a switch that when depressed will feed the preset voltage into channel 1 of the ADC. Unfortunately, when an ADC channel is not connected, it 'floats' between 0v and Vref at random, which means that the switch might appear to be depressed, when it wasn't. The answer to this problem is shown in figure 2. The side of the switch nearest to the ADC connection is tied to 0v via a large resistor, commonly a 1Meg Ohm

Vref, ch1, 0V, R_1, R_2, V_{in}

$$V_{in} = \frac{R_2 \bullet Vref}{(R_2 + R_1)}$$

Figure 1. Potential divider

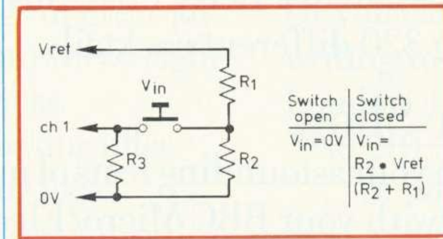


Figure 2. Switched divider

(1,000,000 Ohms). This resistence is sufficient to hold channel 1 at 0v when the switch is open.

When the switch is closed the voltage at channel 1 rises because of the effect of the potential divider. If R_2 is small in comparison to the 1Meg Ohm resistor, the voltage at channel 1 will be very close to the ratio of R_1 to R_2. If R_2 is quite large, say over 50k Ohm, the 1Meg Ohm resistor will act to alter the value of the voltage from the potential divider, because it is always in parallel with R_2.

While a 1Meg Ohm and a 1k Ohm resistor in parellel can be regarded as a 1k Ohm resistor, a 1Meg Ohm resistor in parallel with another 1Meg Ohm resistor would combine to produce one of 500k Ohms. Hence the value of the voltage at the potential divider would alter drastically. In this project the 1Meg Ohm resistor is in parallel with resistor values up to 28k Ohm, and this range can be handled in a linear way from Basic.

Figure 3 shows a potential divider made from nine 1k Ohm resistors. If a voltmeter were to be connected between 0v and the junction of each resistor in turn, the voltage would be seen to rise toward Vref in nine roughly equal stages. Pressing any switch will place its associated voltage on the input to channel 1 of the ADC, which means we can read eight different voltages via the ADC port. If we divide these voltages by a suitable value they can be read as the numbers one to eight, and a 0 voltage means that no keyswitch is pressed. A suitable routine is:

```
  10 REPEAT PRINT FNadc(1):
     UNTIL FALSE
1000 DEF FNadc(x) = ADVAL(x) DIV
     9192
```

This can be taken a stage further by placing the numbers generated into a SOUND command:

```
  10 REPEAT note = FNadc(1)
  20 IF  note = 0  SOUND&11,0,0,255
  30 IF note > 0  SOUND&11, - 15,
     note*4,255
  40 UNTIL FALSE
1000 DEF FNadc(x) = ADVAL(x) DIV
     9192
```

Obviously the accuracy of the sound generated will depend on the scaling factor of 9192 in line 1000. This is the part of the software which may need to be calibrated for each Acumorg.

Figure 4a shows the circuit diagram for Acumorg and figure 4b relates the switches to the keyboard design. The circuit diagram is no more complex than figure 3, except that 28 keys and 30 resistors are used. Trace the potential divider chain from 0v to Vref, ensuring that a switch is connected between the chain and channel 1 at each resistor junction. Notice that a 1Meg Ohm resistor is used to hold channel 1 at 0v when no switch is pressed. It's important to use one per cent tolerance resistors in the circuit, because these will provide greater linearity, making the software easier to write.

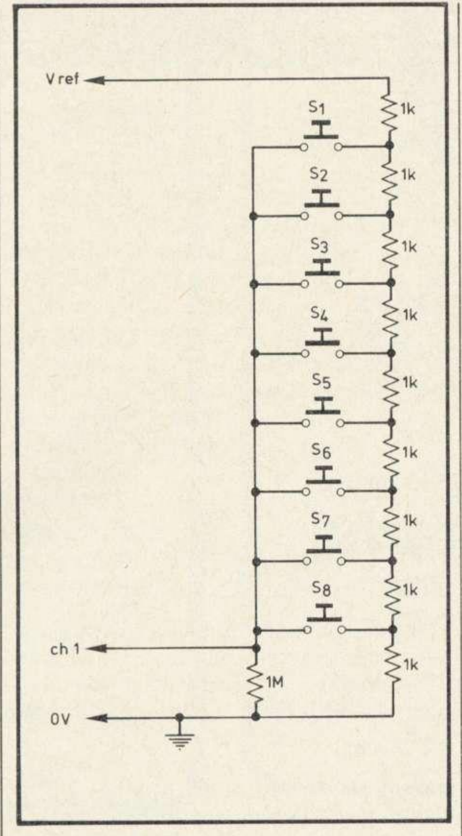


Figure 3. Circuit for a two-octave organ

Figure 5 is the component view of the stripboard showing resistors, switches and wires, which should be fitted and soldered under it in the positions marked. The 'x's are cuts made on the underside of the board using either a spot face cutter, a $\frac{1}{4}$ in drill bit or a craft knife.

Sequence of construction

1. Cut the stripboard in half lengthways – each can be used as the chassis for an Acumorg.

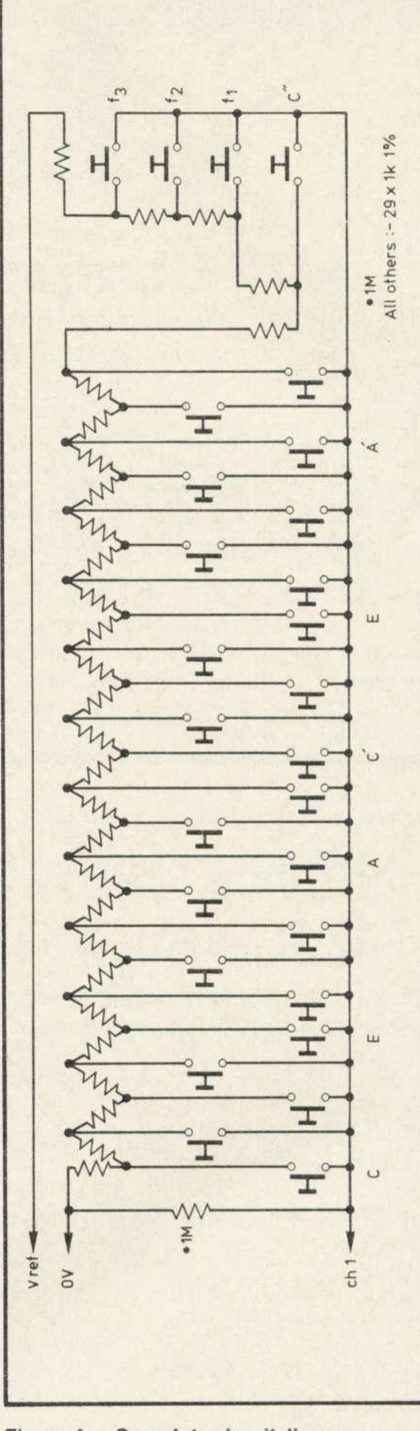


Figure 4a. Complete circuit diagram

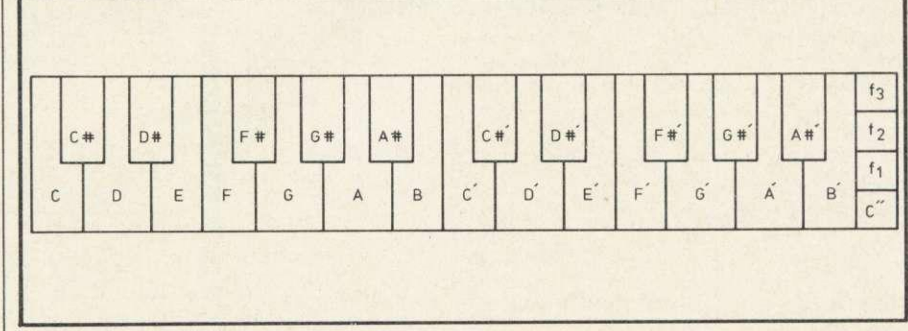


Figure 4b. Key layout

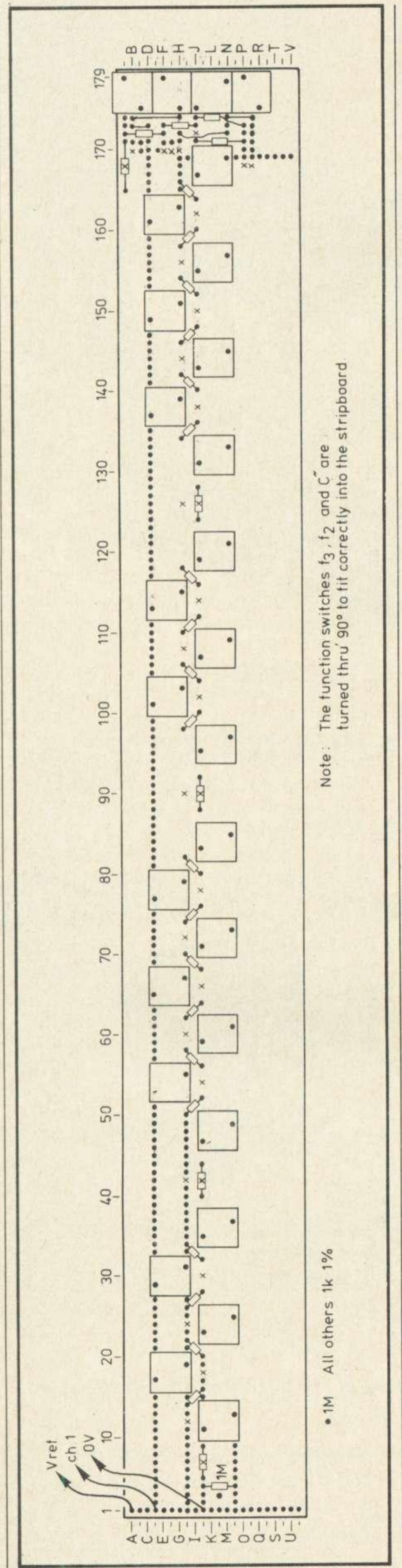


Figure 5. Veroboard constructional diagram. NB: if RS push switches are used, pin position will move along the track

COMPONENTS

Component		RS No.	Price (approx)
1	stripboard (makes 2 Acumorgs) 119mm*455mm*1.6mm	434-201	£4.50
28	PCB push switches	*	£4.20
29	1k Ohm 1% resistors	148-506	£0.90
1	1Meg Ohm 1% resistor	149-228	£0.03
1	15 way 'D' plug	466-185	£1.50
1	15 way 'd' cover	469-572	£1.25
1m	two-core screened cable		£0.20
20cm	single-core 'Hookup' wire		£0.10
	Black and white self-adhesive labels for keytops		£0.50
1m	solder		£0.10
Total			£13.38

**Nestec has agreed to supply PCB switches – the address is Nestec, Kielder House, Newcastle Polytechnic, Coach Lane Campus, Benton, Newcastle-upon-Tyne NE7 7XA. Tel: (0632) 663409. RS PCB push switches are RS no. 337 598 and cost £14.50 for 28. You may have problems in fitting the Nestec switches squarely on the veroboard – see page 80.*

2. Cut the track side of the stripboard at the points indicated. Make sure no links between tracks are accidentally made and that the gaps completely remove the copper tracks around the holes marked 'x'.

3. Fit the PCB switches in the holes shown. Have a dry run and compare the result with figure 5 before soldering them in place. Note that there is a seven-hole gap between switches in the bottom row (apart from the function switches), and that the rows are separated by a single row of holes. If different switches are used, their contact pegs may push through the stripboard in different positions. Try, however, to maintain the connections to lines H and J, and alter the contacts at lines D and N if necessary.

4. Solder the switches in place and trim the solder joints, if necessary, using side clippers.

5. Solder the four wire connections near the function key switches. Trim the joints if they are untidy.

6. Solder the 29 1k Ohm, one per cent resistors and the 1Meg Ohm one per-cent resistor into place, then cut their legs and trim any untidy joints.

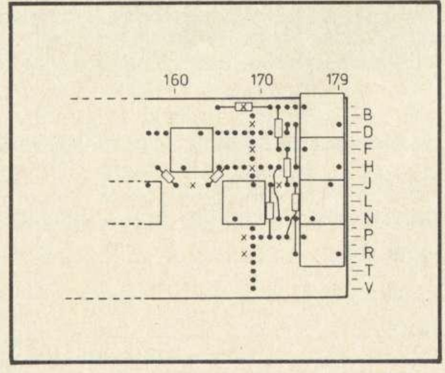


Figure 5a. Resistor layout changes for RS switches

7. Connect the two-core shielded cable to the stripboard as shown, with the screen to track J (the lower end of the potential divider chain).

8. Connect the other end of the cable to the 15-way 'D' connector (making sure

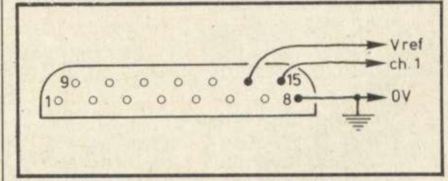


Figure 6. Lead connections to 'D' plug

that the leads are connected correctly) by following the lead colours to it from Acumorg (figure 6). Add the cover to the 'D' connector.

9. Check the trackside of the board for dry joints – they will be a dull grey colour – often caused by too little solder, and for solder bridges between tracks – caused by too much solder.

10. Check the other side of the board for any components that are out of place, and remove and replace them.

11. Make sure the necessary tracks have been correctly cut.

Once the soldering has been done, and the Acumorg checked for mistakes,

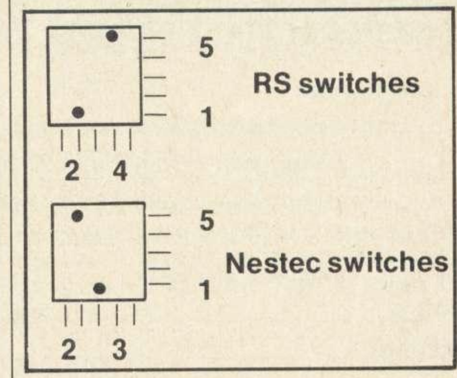


Figure 5b. PCB push switch pin-outs

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the finishing touches should be added. Most electronics shops sell cheap self-adhesive rubber legs. To prevent the board from bending when the keys are pressed, up to eight of these can be struck to its underside.

To make it look more like a piano keyboard, the top row of keys can be covered with black adhesive labels and the lower with white. Note that the key on the far right is C, which is playable and should be covered white. The three function keys should be marked F1:F2:F3 (figure 4b). The protection tabs included with many packs of floppy discs provide cheap keytop labels.

Users who are adept with wood, plastic, fibre-glass or metal might like to make a case for Acumorg, but this isn't essential.

Software for Acumorg

Although some software has been described in introducing the concepts behind Acumorg, it didn't originally function correctly. The greatest technical problem with Acumorg is that the ADCs continually sample the input to each channel, and this is done relatively slowly (milliseconds are very slow in computer terms). This means that pressing a key is not synchronised to the polling of the ADC, with the result that during an ADC conversion the three waveforms found in figures 7a-c can occur.

In figure 7a a key is pressed during an ADC conversion period, resulting in a value for ADVAL1 which does not reflect the correct keypress. The same situation can occur on key release (figure 7b). Because of the voltage change between 0v and V_{in} the value returned will not be correct. Only in figure 7c can it be correct, because the switch is held closed for the full conversion period.

Unfortunately, we cannot be sure which waveform is being returned on any keypress. So we must continually sample the waveform until two values match, indicating that a key is properly held or released. A simple routine for this is:

```
1000 DEFFNadc(x):LOCALa%,b%
1010 REPEAT:a% =
     (ADVALx + 128) DIV 2240
1020 T% = TIME + 1:REPEATUNTIL
     TIME > T%
1030 b% = (ADVALx + 128) DIV 2240
1040 UNTILa% = b%: = a%
```

Notice that two readings are taken roughly 1/100th of a second apart (line 1020). If these are equal (line 1040) then that value is returned to the main program – if not the sampling continues.

It should be clear that the worst case of Acumorg recovering from an out-of-synchronisation keypress is over just two conversion periods. Because this may occur at the beginning and end of a keypress, the sound will generally start and end two conversion periods after that keypress (figure 8). It is therefore best to reduce the conversion period to the shortest time available. This can be done using the command:

```
*FX16,1
```

which only activates ADVAL1, allowing the ADC to run faster, at about 10msec per conversion. It's possible to improve on this, but in practice this is sufficient, as the sound is only an undetectable $\frac{1}{50}$ second out of sync with the keyboard.

The first set of software provided for Acumorg is aimed at users learning to use the keyboard. The programming techniques are relatively simple, and users should, as usual, improve on the software given.

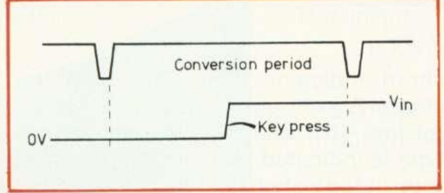


Figure 7a. Key pressed during conversion: incorrect reading

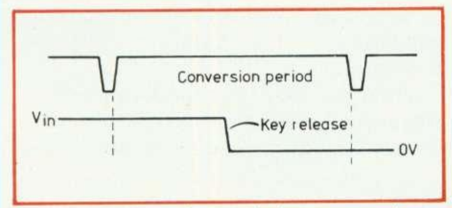


Figure 7b. Key release during conversion: incorrect reading

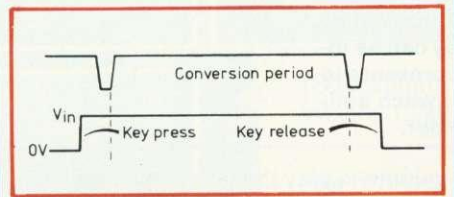


Figure 7c. Key pressed over conversion: correct reading

Program 1 (page 103) shows the few lines of coding necessary to make Acumorg play real-time sound, and can also be used to check its calibration. The main body of the program repeats continually, pushing the current note value into one of the two available SOUND statements. In the development of later software, it was found that lines 30 and 40 could be combined to read:

```
SOUND&11,(-15*SGN(note)),note
*4,255
```

which gives silence for all notes equal to 0. The &11 at the start of each SOUND statement is there because of the need to interrupt any sound channel at a moment's notice. The &1x command interrupts sound from channel x as soon as it's executed.

The only calibration which may be necessary is in line 1010, and once done this line can be added to each program. I found that this line needed altering in only one out of five prototypes.

To check the calibration, simply replace lines 30 and 40 with the line:

```
30 PRINTnote
```

Now connect Acumorg up to the BBC micro and RUN the amended program 1. With no keypresses the number 0 should appear.

Press and hold each note in turn. As each is pressed its corresponding number from 1 to 28 should appear and *not* change. If the numbers from 1 to 28 all appear correctly then Acumorg is calibated. If any number does not appear or flickers between two values, a small amendment to the calibration is needed. Alter the 2240 of line 110 by one unit either way, then try again. If the flickering becomes worse try the other way. If adjusting the number 2240 over a range of + − 32 does not cure the problem, reset it to 2240 and alter the other parameter, the 128. This can be done in steps of 32 between 32 and 224.

Program 2 allows the organ to print understandable musical information, corresponding to the pitch of sound produced by each keypress. The data is shown in line 1050 and is placed into the array 'note$' which is two chromatic octaves (28 notes) long. On pressing a key the note is sounded, and the coding at line 60 prints out each new note as it's played. Rests and internote gaps are not shown because these are interpreted as a 'delete' code, configured by line 40.

The program can be altered to show just the number of the keypress, giving SOUND statement values which are directly transferable to other Basic programs such as for jingles. The alteration is to line 60 where:

```
PRINT note$(note)
```

becomes

```
PRINT note
```

Line 80 sets the note produced to match the name printed.

Program 3 introduces the user to the idea that not all the keys on the organ need to initiate sound. The three function keys can be set to alter the value of the variable 'octave'. This is done in lines 90 to 110.

Line 90 checks for a function key (a key with value more than 25) and if it finds one pressed, blanks out the '*'

indicating the current octave. Line 100 alters the octave by subtracting 26 from the keynumber, giving a value from 0 to 2. This is used to print a new indicator '*' in the correct position. Finally, for keypresses over 25, the program loops round in line 110 so that no sound is produced. When the octave has been set, it's used by line 130 to produce a sound in that octave. If the '48' of line 130 was altered to '96', the sound would rise in double octaves.

Program 4 demonstrates how the Acumorg function keys can be used to control three of the organ's features. F1 controls the octave range up or down one octave. F2 alters the volume. F3 selects whether each key pressed plays a single note or a major or minor chord based on it. Chords can be used to produce an accompaniment to another instrument or even to another Acumorg.

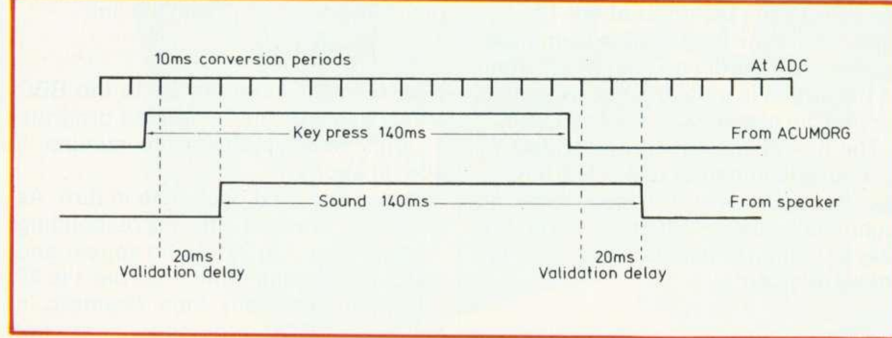


Figure 8. Timings of worst cases

The function keys are trapped by the coding in lines 110 to 130. The three basic procedures which handle them are: PROCoctave, PROCvolume and PROCchord.

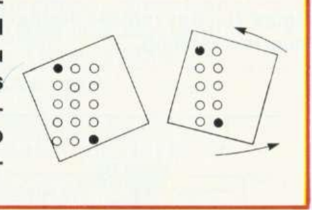
PROCoctave is found at lines 270 to 310. First it clears the current screen octave indicator (line 270), then the octave is toggled between 1 and 0 (at line 280), and the new octave is indicated (at line 290). Line 300 is included so that the function key must be released to prevent multiple toggles. The procedure returns to the main program with the variable 'octave' now switched to 1 or 0, depending on its last state.

Found at lines 220 to 600, PROC volume first clears the current screen volume indicator (line 220). Next the volume is toggled between 1 and 0 (at line 230), then the new volume is indicated (at line 240). Line 250 is included so that the function key must be released to prevent multiple toggles. The procedure returns to the main program with the variable 'volume' now switched to 1 or 0, depending on its last state.

PROCchord is found at lines 170 to 210 First it clears the current screen chord indicator (line 170), next the chord type is toggled between 0, 1 and 2 (at line 180) and then the new chord type is indicated (at line 190). Line 200 is included so that the function key must be released to prevent multiple toggles. The procedure returns to the main program with the variable 'chord' now switched to 0, 1 or 2, depending on its last state.

When any key less than value 26 is pressed, the program uses the previously set values of octave, chord and volume to play the note indicated. This is done in PROCplay. PROCrest is only used to produce musical rests and inter-note gaps.

THE Nestec switches may be used without modification, but because of their pin arrangement they will be positioned at an angle to the main board. If you want the switches to sit square on board proceed as follows. Gently bend pins inward until they can be inserted into correct holes. While applying pressure to keep the switch in the board, rotate the switch anticlockwise until square with board and solder.



The PROCplay routine is designed to play either single notes (at line 370), or chords. If a single note is required, the variable 'chord' will have been set to 2. If 'chord' is 0 or 1, a second voice plays at line 390. If 'chord' has a value of 0 the SOUND statement of line 400 is played and the routine concludes, giving a major chord. If the value of 'chord' is 1 then the SOUND statement of line 410 plays, which alters the sound to a minor chord.

The organisation of each sound statement is such that the values of 'volume' and 'octave' are placed in expressions which evaluate to the correct parameters for the SOUND required, without complex use of the IF statement. The contents of line 370 are shown in figure 9.

Program 5 allows Acumorg to play like program 1, except that whenever F1 is pressed the keypresses and durations are stored in two 100-item lists. These lists can be replayed at a moment's notice by hitting F2. When F3 is pressed the two lists are cleared, ready for a new tune to be recorded. With a small amount of alteration the program could be improved to enable the loading and saving of files to and from disc.

Lines 100 to 140 handle the function keys by moving the screen indicator (lines 100 and 110), then examining the keypress further. Line 120 checks for function key 1 and if this is currently pressed sets the organ variable 'mode' to 1. Line 130 checks for F2 and sets 'mode' to 2, then replays any music stored. The benefit is that the user can try out other tunes without them being recorded until F1 is pressed again. If it is hit when some music is stored, new recordings will be added to the end of the last recorded piece.

Line 140 checks for F3, the clear key. If this is encountered at any stage the pointer 'top' to the end of the lists of stored music is reset to 0. Line 150 handles the recording of played notes, but the 'mode' must be set to 1 by function key 1 (Record).

The Replay procedure repeats the notes played, emphasising them and not the inter-note gaps. Altering line 230 will change this emphasis. If during the playback the clear key is pressed, the playback will be cut short but the music data will not be removed. Hitting it again will reset the music data pointer 'top', effectively clearing the stored data. This program is experimental in its present form, and users are encouraged to restructure and improve it.

This project relies on good soldering ability, plus willingness to experiment, change and customise hardware and software. For beginners attempting the project, I suggest you work slowly and methodically, ticking off the stages. If you have to break off work, make sure the equipment is kept together. Be careful with the soldering iron (especially with children) as it's a source of great heat and electrical current. After the construction of the hardware only enter program 1 until the organ is functioning properly, then move on to the other programs.

Acumorg demonstration and control programs are on yellow pages 103–104.

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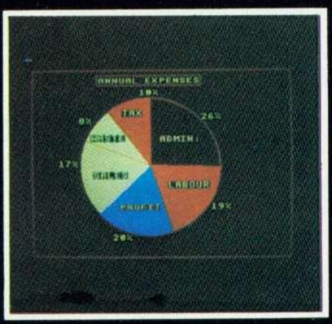
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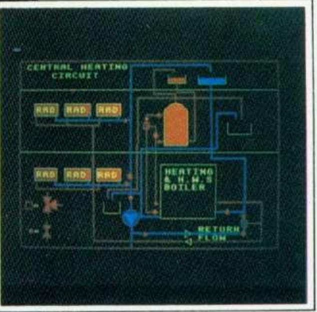
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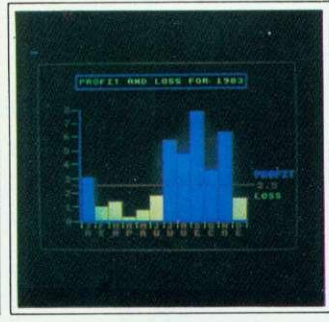
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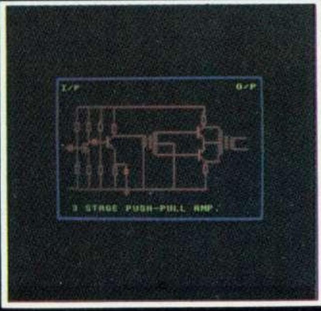
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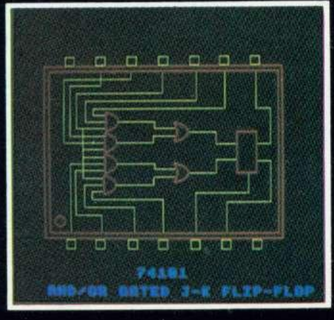












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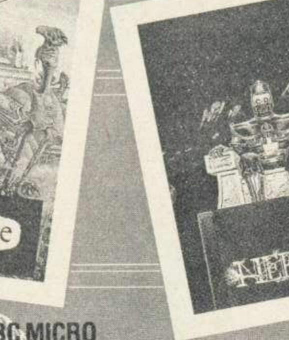
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DUMPING SECRETS

Dear Mr Hill,
Please can you help me and a number of other frustrated printer-users with a problem which I know can be solved but with a little knowledge needed from someone of your standing. The problem to which I am referring is the screen dumping of 'protected' screens, games etc, on an Epson printer. By 'protected' I mean that the program is protected in such a way that one cannot hope to get into it and add a nice little screen dump. In the July issue of 'Acorn User' you talk about dumping a reasonable representation of the screen to the printer. This is all very well if you have a nice graphics program which is listable, but please tell us – in layman's terms so even an idiot like me can understand – how on earth you produced the dump of the 'Q*Bert' screen on page 165 of July's issue.

At every show you see lovely dumps of nearly every game ever released pinned up all over the stands, but nobody seems to know how it's done!

What's needed is a nice machine code program that can be loaded at an obscure address and which will interrupt any program while it is running and dump whatever is on the screen to the printer. Your rival magazine 'Micro User' published one several months ago which claimed to do this but out of nearly 100 games tried, it only managed to dump 'Hopper' by Acornsoft. Please write or find me a program with which I can happily dump games screens with my BBC and Epson.

Thank you for your time and consideration, and I hope you can help me out with this most frustrating task.

Yours faithfully
A G Postle

George Hill's three programs solve a reader's problem with dumping freeze frames of arcade action

DEAR Mr Postle, The time has come to blow the gaff. To do this kind of screen dump it is essential to have a machine-code dump. The colour dump used for *Q*Bert* sat in page 10 (&A00 to &AFF) and was published with my review of the Canon PJ1080A colour printer (*Acorn User*, July issue, pages 163-5). This article contains the assembly language for a machine-code dump for a dot matrix printer.

When I dumped *Q*Bert* (and incidentally *Snapper* and some other games screens) I cheated!

*Q*Bert* has a Basic controlling program, and so I found a convenient place and inserted the line:

```
CALL&A00
```

and hey presto!

Snapper was a bit more tricky, but is a well-constructed piece of machine code. It therefore consists of a number of JSR instructions at the beginning of the code. I looked at the disassembled listing and poked the two bytes:

```
&00 &0A
```

(the start address of my dump) in place of various subroutine addresses until the dump occurred at a suitable juncture.

None of this really helps you with your problem, but it does indicate an approach for programs for which the method I explain below does not work.

There are three pre-requisites if you want to carry out an 'instant dump'. First, you must have a piece of machine code buried in the machine that can do the dumping. Second, this piece must be found a home where it does not interfere with the normal functioning of the computer, or with the game in question. Third, you must be able to 'freeze' the game.

First the freezer. The best way to interrupt any computer process is to generate an 'interrupt'. This means that the computer detects an 'event' and transfers control to a piece of machine code. The address of this machine code is 'vectored' (ie, transferred) through a memory location reserved permanently for this purpose. The vector address in question is &200 and &201. The event we want to detect is 'key pressed'. This is 'enabled' by the operating system call:

```
*FX14,2
```

We now write our interrupt handling machine code, and deposit its address at &200 (low byte) and &201 (high byte).

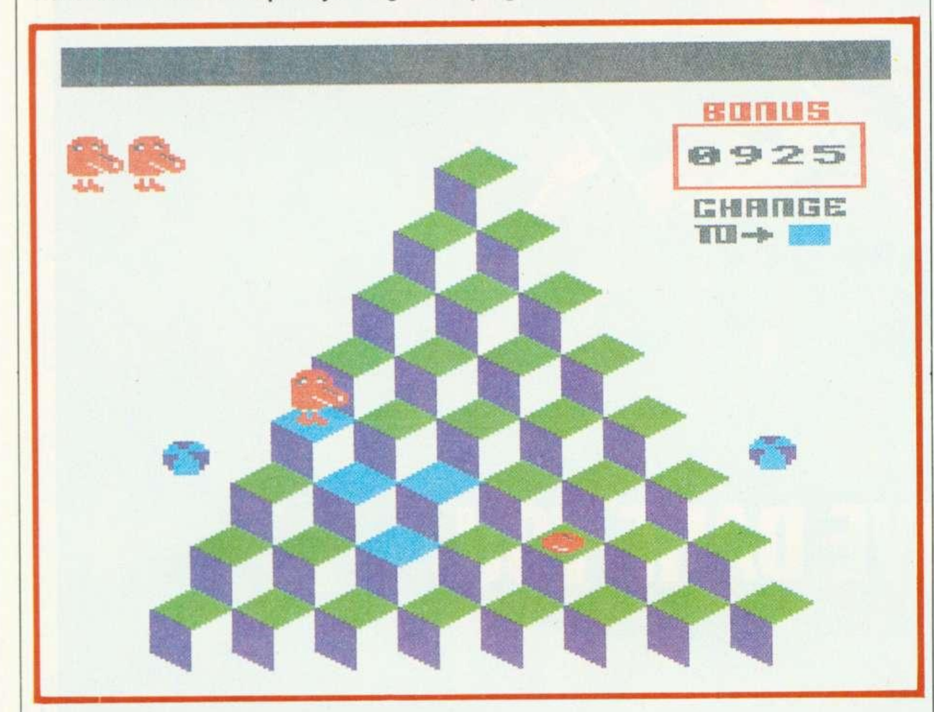
There are three programs. The first is *Autocol*, which sets up the interrupt handler at address &9C0 (where the speech processor has its work-space or in the middle of the cassette output buffer, which will be unused unless you save something), which is relatively safe. It then performs the necessary *FX call and deposits &C0 at address &200 and &09 at address &201. When a key is pressed the CPU completes its present instruction, then performs a JMP (&200) instruction. This jumps to the location pointed to by &200, which is &9C0.

The routine preserves the registers by pushing them onto the stack. The

Dumping 'Snapper' was tricky



'Hunchback' screen dumped by George Hill's programs



The Q* Bert screen that prompted Mr Postle's letter

last one preserved is the Y register, which is transferred to the stack through the accumulator (tya:pha). This results in the contents of the accumulator being the previous contents of the Y register. This contained the ASCII code for the key which had been pressed. It is compared with '@' (the ASCII code is 64). If it was not @ then the registers are restored and we exit gracefully. If it was @ then we jump to the dumping subroutine. Any machine-code dump will do, but you must find it a suitable home, *LOAD it there and define its start address as 'dumpstart'. (I found most dumps for normal dot-matrix printers quite unsuitable for producing multicoloured screen pictures.)

The @ key was chosen because few games appear to use it as a control key. It should be clear that this method will work with most games and almost all Basic graphics programs. There are exceptions, however. Some games use my program's workspace at &900 and &A00 and attempt to overwrite the dump – *Hopper* appears to do this, resulting in a 'Bad program' message. Some have their own interrupt routines to handle the keyboard and so reset &200 and &201, by-passing the interrupt handler (*Rocket Raid* does this). The method works for a surprisingly large number of games, though.

The second pair of programs comprises *Dumper*, a simple setting-up program, and *Autodmp*, which is much more complicated and deserves some explanation. It generates a machine code dump suitable for the ESC L n1 n2 double-density graphics. This occurs on Stars, Epsons, CP80, and Canon printers, and probably many others.

Autodmp sets up two pieces of machine code of one page each. They are interconnected but need not be consecutive. CODE1 contains all the storage space, some of the subroutines, and the interrupt handler. It is preceded by a jump instruction, so that it can be called at address &900. The second piece of machine code (CODE2) actually carries out the dump.

My most recent article on screen dumps introduced the subject of 'logical' and 'physical' colour dumps (July, page 167). This dump is a compromise. It dumps modes 2 and 5 in physical colour (otherwise some games screens which use VDU19 calls extensively look disappointing) but modes 0,1 and 4 in logical colour (otherwise the contrast is very poor).

The first problem remains – where to put the machine code. I have solved it for most disc machines – &900 to &AFF remains clear most of the time. The problem for tape machines is that &D00 should be free, and that is where the second piece of code is located, but many games programs use this page of memory. Try &B00 (the soft key buffer – often unused) as an alternative. These modifications will have to be left to someone who uses tape regularly.

A desirable side-effect of this last system is that it can be used in the absence of the interrupt handler. If you:

```
*LOAD CODE1
*LOAD CODE2
```

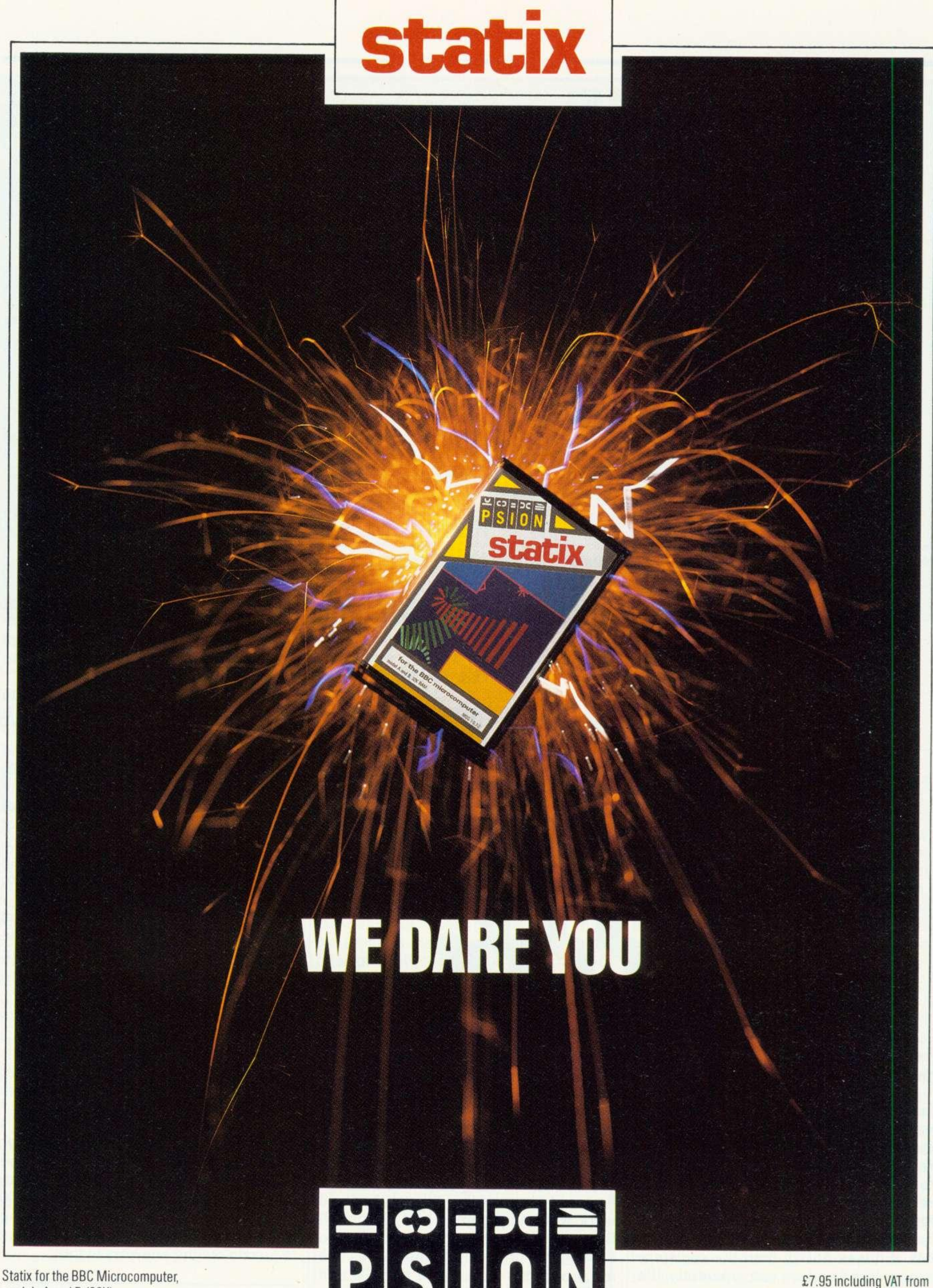
inserting the line:

```
CALL &A00 (&D00 on tape)
```

will cause an excellent screen dump.

So there you have it, Mr Postle. I hope it meets with your approval. I must admit that I still had to cheat for *Q*Bert* even with the new system. The problem is that games using more than three ENVELOPE commands use &900 for their storage and we get overwriting of the dumping system. I leave readers to puzzle out the answers to that.

The Autocol, Dumper and Autodmp programs are listed on yellow pages 105-108



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COMBINATION CRACKER

Win a £50 barcode reader package in our Christmas quiz

As the snow swirls around you in the wilds of Long Acre and you pull your adventuring gauntlets tighter around your fingers to keep out the cold, a pitiful sight shuffles out of a damp and darkened corner and blocks your passage.

Dressed in combat gear (army surplus – Battle of Verdun) and with a Santa Claus beard which looks three-days genuine, it parts its lips and a shallow moan emanates towards you: 'Spare us a few bob for a drink, guv. Season of goodwill y'know'.

With a shock, you perceive from the icicles dangling from his gold earring, that you have just encountered Mad Alex – he who has consumed more of your time in the past year, by giving you ridiculous puzzles to solve, than you would have wished.

'Begone, wretch!' you cry. 'If I give you money, far from spending it on honest drinking, you'll only put it towards a second processor!'

'Honest, guv, I won't. In fact, if you were to accompany me to that excellent hostelry yonder, The Freemasons' Arms, I venture to suggest you might learn something to your advantage.'

Your heart sinks. You know only too well the mental anguish and late nights entailed in trying to acquire one of Mad Alex's advantages. And yet, one day, maybe?

In a dream, you cross the threshold and before you know it Mad Alex has his hands on your pouch of sovereigns and is distributing *largesse* to all and sundry.

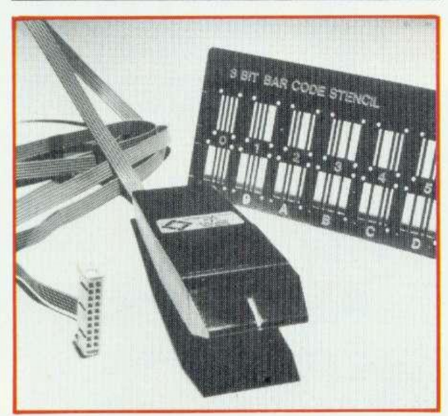
After the first few flagons have been quaffed, an air of weariness descends upon you. 'Er, are these people from the *Acorn User* dungeon?' you enquire of Mad Alex, fool that you are.

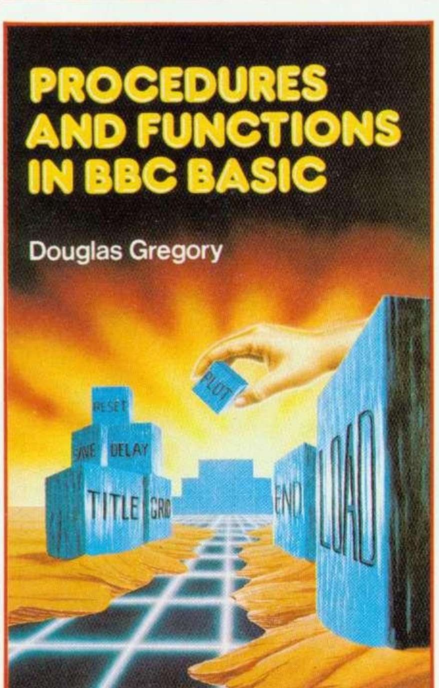
'Indeed.'

'And I suppose I have to solve some problems before I can talk to them?'

Mad Alex clicks his fingers and Kate the serving wench, scuttles over with a sheaf of paper. Written on it are the following puzzles:

THIS MONTH'S PRIZES





Problem 1

Find the largest and smallest numbers containing any nine of the digits 0–9 (no digit to be used more than once) which is exactly divisible by 11. What is the difference?

Problem 2

23∧3 + 24∧3 + 25∧3 is the smallest square formed by three consecutive cubes (excluding 1). What is the smallest square which can be formed in this fashion by more than three consecutive cubes (again, excluding 1)?

Problem 3

Mad Alex had five hogsheads of his beloved extra-special Bulls Blood and one hogshead of el cheapo Plonko (the latter reserved for the rare non-occasion). The hogsheads contained 15, 16, 18, 19, 20 and 31 gallons. Under straitened circumstances he sold part of the Bulls Blood to one dwarf dealer and twice as much to another, leaving him with only the hogshead of Plonko. How many gallons of Plonko did he have?

Problem 4

At the dwarfen temple are two bells which toll to indicate important events. The first bell rings every $1\frac{1}{3}$ seconds and the second bell every $1\frac{3}{4}$ seconds. To a dwarf ear, however, two peals which occur within $\frac{1}{2}$ second or less sound like one. If both bells begin ringing exactly at midnight how many peals will have been heard fifteen minutes later?

Alex explains to you that the serial number to the vault containing the treasure is the sum of the solutions to these four problems – adjusted by what you are told by the people he is about to introduce to you.

He goes on to explain that all these people (who are currently celebrating your good health at your expense) are either dwarfs or trolls. For the benefit of newcomers to the dungeon, it should be recalled that dwarfs invariably tell the truth and trolls equally invariably lie. 'Be certain that you do only what a dwarf tells you,' Alex warns you. 'Ignore all instructions from trolls.'

At Table 1 there are two people who raise their glasses to you.

A: 'We are both trolls. Add the solution to problem 1 to your answer.'

B: 'Add the solution to problem 3 to your answer.'

At Table 2 there are three people.

A: C thinks exactly one of us is a troll. Add the square root of the solution to problem 2 to your answer.

page 91 ▶

See page 91 for August competition results

COMBINATION CRACKER

◀ page 89

B: C is a dwarf. Add the solution to problem 2 to your combination.
C: I am a dwarf. Subtract the solution to problem 3 from your number.

At Table 3 three more imbibers greet you.
A: B thinks C is a troll. Add the solution to problem 4 to your number.
B: A is a troll. Subtract the solution to problem 4 from your answer.
C: A is a dwarf. Add the solution to problem 1 to your number.

At Table 4 another trio sits swilling your ale.
A: C does not believe we are all dwarfs. Add the solution to problem 3 to your number.
B: C is a dwarf. Add the solution to problem 1 to your answer.
C: Subtract the solution to problem 4 from your answer.

Now you have the combination to the treasure vault. What is it? Answers on a postcard, please, to arrive not later than 4 January 1985, addressed to December Competition, *Acorn User*, 68 Long Acre, London WC2. The first five correct solutions out of the bag win an MEP barcode reader package, each worth £50, kindly donated by Addison-Wesley Publishers. The next five correct entries will receive the book *Procedures and Functions in BBC Basic* by Douglas Gregory.



THE August competition attracted an enormous entry – approximately 2000 postcards arrived in our office from as far afield as Zambia, New Zealand and the Middle East. Evidently the prospect of winning a modem and talking to the world inspired you all.

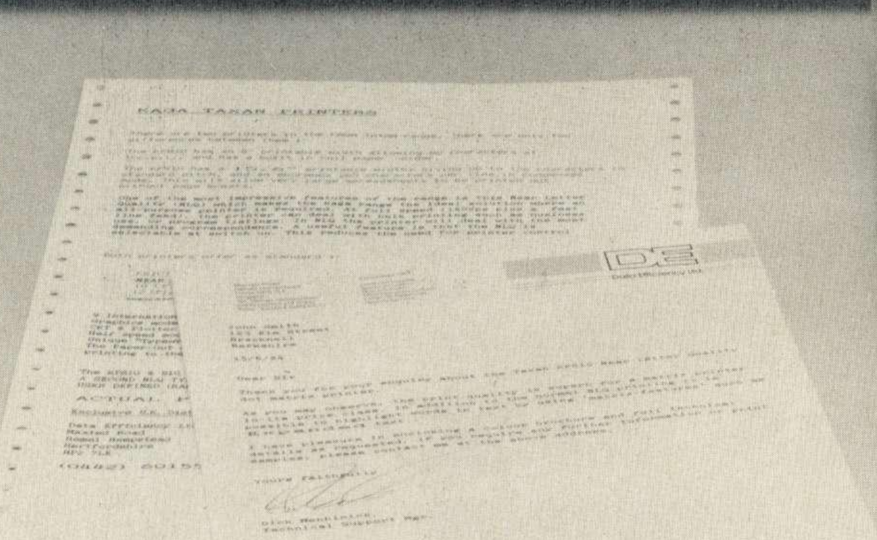
Mad Alex's message was a simple letter-for-letter substitution code which then posed its own puzzles, the answers to which were:

26 Letters of the Alphabet
7 Wonders of the Ancient World
1001 Arabian Nights
12 Signs of the Zodiac
54 Cards in a Deck (with the Jokers)
18 Holes on a Golf Course
200 Pounds for Passing Go in Monopoly
3 Blind Mice (See How They Run)
24 Hours in a Day
57 Heinz Varieties
29 Days in February in a Leap Year
12 Players in a Cricket Team (including the Twelfth Man)

The only one which 'stumped' some of you was the last one. 'TM' was occasionally interpreted as 'team manager' or, even more bizarre, 'third man' – that's not cricket!

The five winners of the Torch Unicomm modems were A Waluish of Essex, Sue Mounce of Devon, Mark Betteridge of Doncaster, E Southall of Surrey and Carol Nelson of Leicestershire. A special mention to Karen Clark of Sydney, Australia, whose postcard featured an attractive rear view of what she claimed to be herself surfboarding naked!

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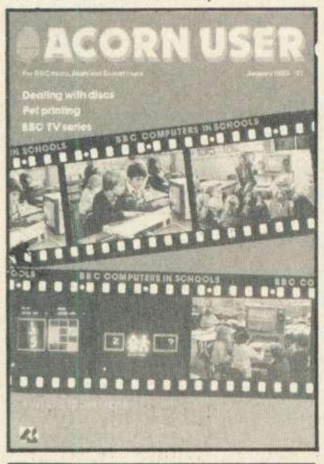


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6. January 1983 MEP school launch. *FX commands for sound. Second BBC TV series. Machine code 3 – two pass assembly. Disc drives for the Beeb. Programming forum. Program protection. Micros in schools – new series. Commodore Pet printer used with Beeb. BBC programs written on an Atom. Extra Atom memory.



7. February 1 MHz bus examined (4). 3D Atom graphics (3). Atom BBC Board reviewed (3). Machine code 4 – memory (5). BBC Computer Literacy update (1). Atom error handling (2). Micros in schools 2 – getting organised (6). Hints and Tips (4). Beeb Forum (3). Reviews of *Wordwise* (2) and the Amber printer (1). ***

8. March Chess on the BBC micro (3). Sound on the Beeb (4). Printers for beginners (4). Atom analogue converter (2). Schools 3 – micros and maths (6). Machine code 5 – indirect addressing (3). DIY lightpen (5). MEP's *Microprimer* review (2). Atom Ross toolkit review (1). Beeb Forum (2). Assembly language and Pascal book reviews (2). ***

9. April *Hexangle* game listing (4). Bach on the Beeb (4). Hints & Tips on disc drives (4). Machine code 6 – the CALL statement (4). Interfacing the 1 MHz bus (3). Schools 4 – young children and micros (6). Graphics listings (2). Printers for beginners 2 (4). Reviews of BCPL, educational software and Atom software (3). ***

10. May Review of Basic II. Graphics listings. New *FX calls in OS1.2. Colour mixing on the Beeb. Jazz, blues and folk on the BBC. Schools 5 – language development. DIY Beeb interface box. Atom sound board. A to Z of printing: how to get going. Hints and Tips: PROCs, discs and FNs. Printer, software and book reviews.

11. June Techniques series – sorting. Hints and Tips: 50p network. Drawing techniques and CAD. Machine code: interrupts. Schools 6 – information technology. Atom Forum. Beeb Forum. Printers – write your own graphics dumps. Comparitive review of *View* and *Wordwise*. Three graphics packages reviewed. Test of *Acorn User*'s interface box.

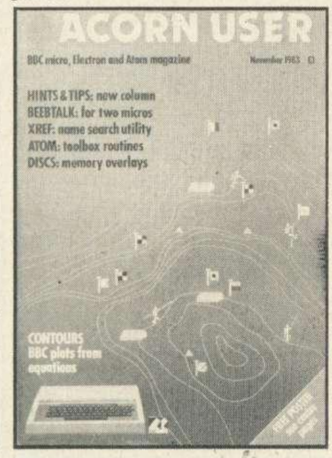
12. July Techniques – hash tables. Hints and Tips: logic made easy. Recursion and graphics. Handling strings. Two ideas for passing variables. Beeb aids the blind. DIY second keyboard. Beeb Forum. Sounds on the Atom. Hardware, firmware, software and book reviews. Atom Forum.

13. August Printer graphics and dumps. Techniques – Tree structures and sorting. All the fun of the fair. 40/80 disc copier. Colour painting. Basic II: random access files. Screen dumps for Olivetti, Centronics and Seikosha. Atom strings. Reviews of Tandy CGP115 printer, five educational packs, A to D converter.

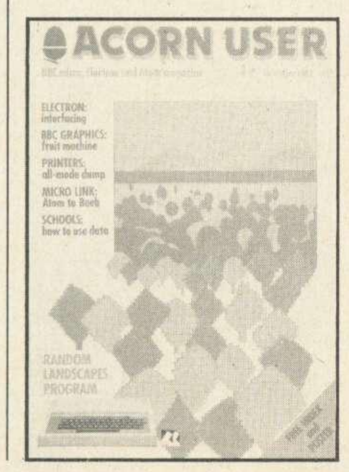
14. September Techniques – ink-blots and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega Monsters* game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual, *Logo* for schools, Hobbit floppy tape and books.

15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*. Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.

16. November Techniques – impossible problems. Contour graphics. Connecting two Beebs together. XREF: sorts & lists variable, function and procedure names. Assembler ultilities in Basic II. OS, VDU, *FX, OSBYTE calls – **pull-out poster**. Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.



17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics **pull-out poster**. **Index:** July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Beebs, Atoms . . . or Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.



18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues, Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure. Reviews of ultilities, software, *Beeline* wordprocessor, educational packages, two chess programs.



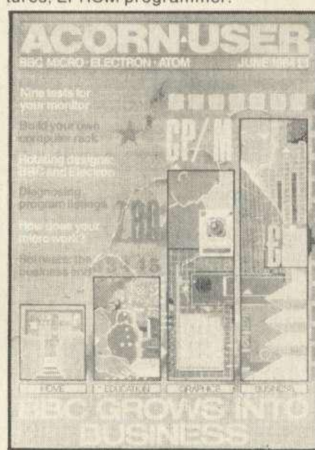
19. February: Adventures special issue Techniques – efficient sorts. PROC for a numeric keypad on the Beeb keyboard. 12 graphics listings. Random access filing on disc. Locking files. MCP40 printer/plotter looked at. Hints & Tips. Beeb Forum. Make discs readable on 40 and 80 track drives. Screen memory organisation. Hints on adventure design. Adventure action. Adventure ideas in computer language. Text compression. Word-crunching. VIA chip on Electron to drive a parallel printer. Atom Forum. Schools – simulation packages. Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideway RAM board, software.

20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp 1. Cube graphics. Printer driver for View. Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.

21. April Beeb graphics on TV. 6845 chip explored. Advanced filing systems. Lisp 2. Hints & Tips. Beeb Forum. Choose disc tracks to copy. Function key editing. Teletext dumps. CES scrutinised. Passing variables. Computer Concepts' graphics ROM. Schools – simulations. Calculating Easter dates. Better programming. Atom Forum. Atom ROM routines. Converting BBC to Atom Basic. Three printers compared. Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors. 93

22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's Grafpad, *Edword* wordprocessor, 4 sprite generators, Opus microdrive, Beasty, software.

23. June Acorn Z80 second processor. Forth. Graphics to brighten up your games. Soft Pottery graphics. Go faster and save memory space. Rapid search and load routine for tapes. How the Beeb and Electron work 1. Business: reviews and how to gently enter office computerisation. Education – adult literacy. Dumping Atom programs on the BBC. Atom Forum. Software copyright laws. Hints & Tips. Techniques – B-Trees. Beeb Forum. Reviews of monitors, printers, books, software, adventures, EPROM programmer.



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E·I·G·H·T of the G·R·E·A·T·E·S·T

During 1984 thousands of readers have played the Acorn User software games **Swordmaster** and **Trek**. Now, just in time for Christmas, we have expanded the range with six more – tremendous games on cassette and disc. Every one is an absolute winner and, of course, great value. Give yourself a present this year, with the best wishes of Acorn User.

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Make sure you play this adventure with the lights on. It plunges you into spine-chilling reality, where you can almost smell the dank odours and feel the terror around every corner. Eyes peer at you through the gloom and all manner of creature awaits your slightest error. Try to find and destroy Dracula, but *remember there are fates worse than death.*

The game, written by Andy Mitchell, includes suitably eerie music and surprise graphics, and we accept no responsibility for heart attacks suffered as a result.

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TREK was the first game to take advantage of voice synthesis on the BBC micro – and uses joystick or keyboard.

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Versions have been written for BBC micro and Electron to use both machines to their full. The BBC tape uses voice synthesis (if the chips are fitted).

The game has been extensively developed from Tim Heaton's famous Trek III. It barely fits into 32K.

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SWORD MASTER

SWORD MASTER is one of the few two-player games around, and is designed for joystick or keyboard.

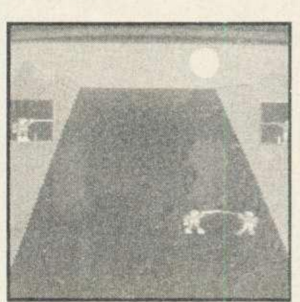
Sword Master by Ken Worrall is based on the fencing rules written in 1190 by Herman von Salza for the Deutscritter Order of Teutonic Knights. It features full-colour machine code animation of a sword duel between two knights.

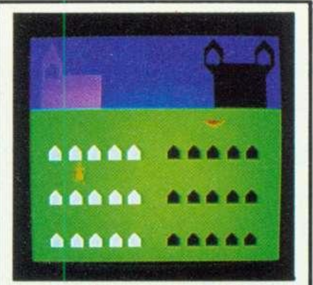
'. . . A quality game with high class graphics . . . one of the most enjoyable games I have played' – **Home Computing Weekly**, June

'Swordmaster is an immensely entertaining game with excellent graphics and animation' – **Personal Computer Games**, June

'Swordmaster is a unique game . . . one of the few two-player games that makes more than a token gesture towards truly interrelated action' – **PCN**, June

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In this superb machine code action game by Ken Worrall you assume control of the body's defences, journeying into the three-dimensional labyrinth of the human arterial system. Invading colonies of bacteria advance relentlessly and you must destroy as many as you can. If you fail to keep the bacteria count low they attack individual organs. You must then frantically follow the network of arteries to reach the site of infection. Too many critical areas and you die.

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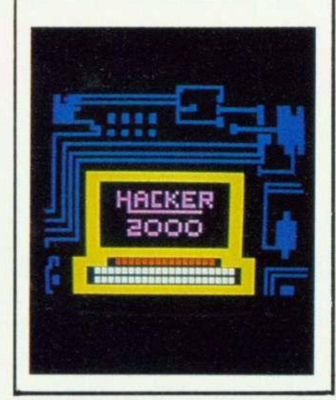


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In the year 2000 only two classes survive, Programmers and Proles. As a Prole, your only escape from a life of drudgery is to 'hack' your way into the massive Multivax complex in order to change your Brain Scan Report and obtain money to bribe the Thought Police.

You may gain vital information with the assistance of the Duty Android in a tour of the complex. If you manage this, you're on your own. From here on you start to appreciate the originality of the game in its representation of a real-time system. You'll need all your powers of logic and some lateral thinking to use the information you glean to 'hack' through the Multivax systems. Your goal can be reached in an unlimited variety of sequences.

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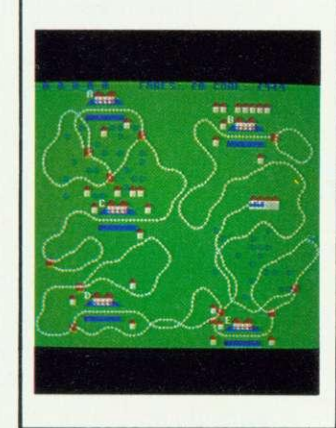


TRAINS

This classic game by Peter Balch requires quick wits and clear thinking. Your aim is to manoeuvre a number of trains around a complex network of track, as you pick up fare-paying passengers and deliver them to their destinations. All the time your valuable stocks of coal are dwindling. If you succeed, you have even more trains to control and more passengers to collect. And as if this were not enough to cope with, you are confronted by the Demon train over which you have no control.

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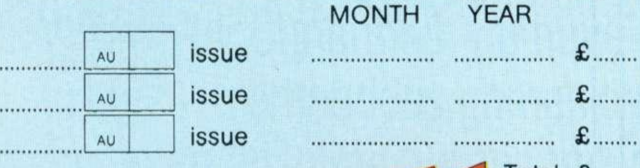
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Beeb Forum, page 115, listing 3

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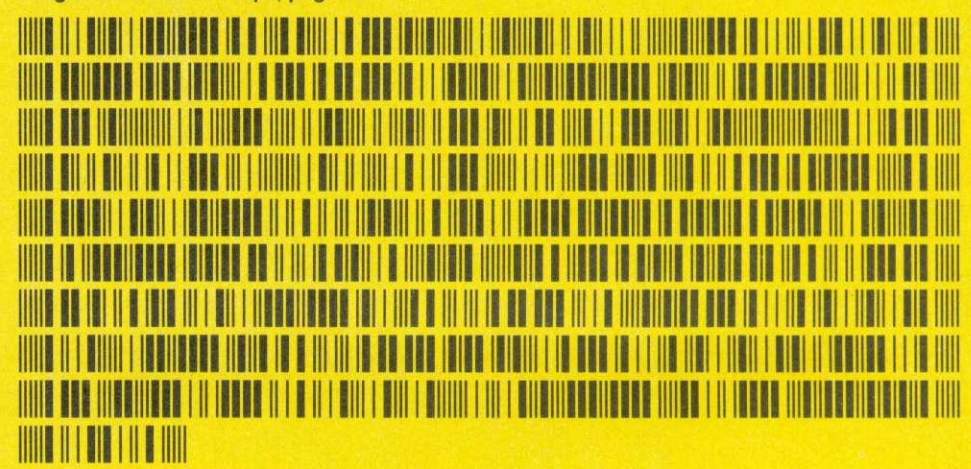
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Program 1. Hints and Tips, page 52



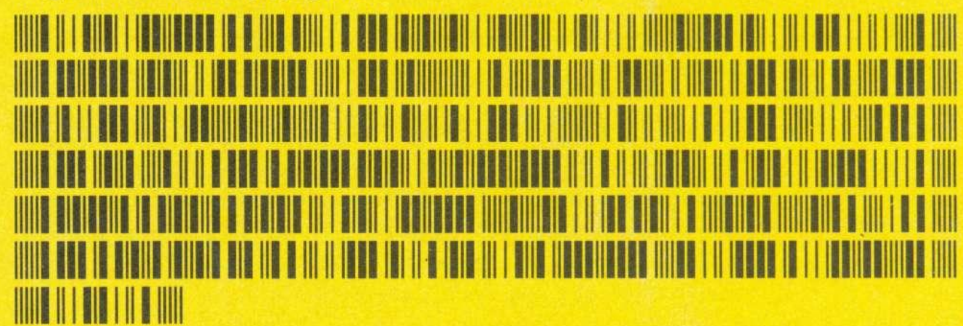
Program 2. Hints and Tips, page 52



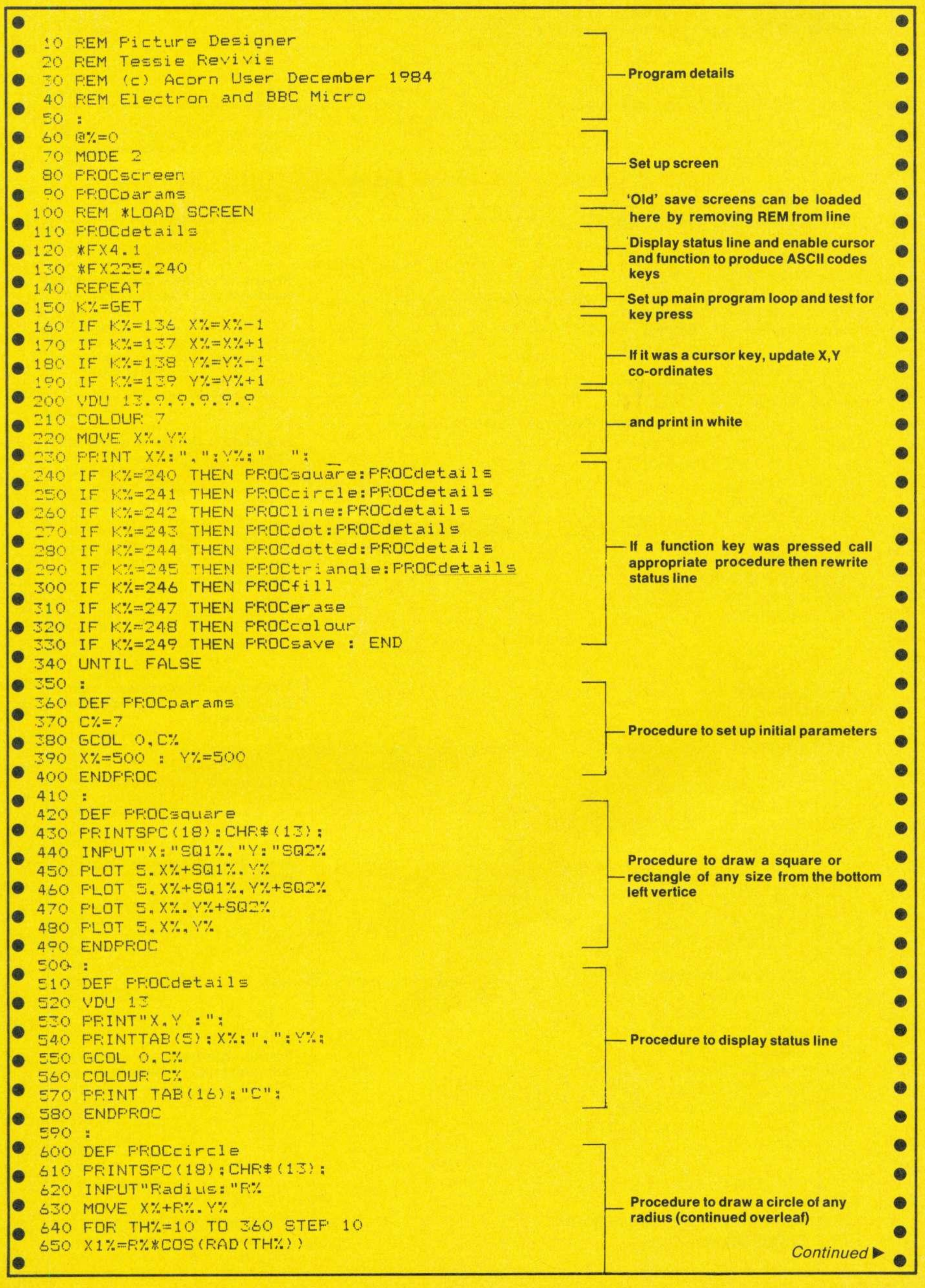
Program 3. Hints and Tips, page 54



Program 4. Hints and Tips, page 54



See 'Painting by programs', page 41



```
 10 REM Picture Designer
 20 REM Tessie Revivis
 30 REM (c) Acorn User December 1984
 40 REM Electron and BBC Micro
 50 :
 60 @%=0
 70 MODE 2
 80 PROCscreen
 90 PROCparams
100 REM *LOAD SCREEN
110 PROCdetails
120 *FX4,1
130 *FX225,240
140 REPEAT
150 K%=GET
160 IF K%=136 X%=X%-1
170 IF K%=137 X%=X%+1
180 IF K%=138 Y%=Y%-1
190 IF K%=139 Y%=Y%+1
200 VDU 13,9,9,9,9,9
210 COLOUR 7
220 MOVE X%,Y%
230 PRINT X%;",";Y%;"  ";
240 IF K%=240 THEN PROCsquare:PROCdetails
250 IF K%=241 THEN PROCcircle:PROCdetails
260 IF K%=242 THEN PROCline:PROCdetails
270 IF K%=243 THEN PROCdot:PROCdetails
280 IF K%=244 THEN PROCdotted:PROCdetails
290 IF K%=245 THEN PROCtriangle:PROCdetails
300 IF K%=246 THEN PROCfill
310 IF K%=247 THEN PROCerase
320 IF K%=248 THEN PROCcolour
330 IF K%=249 THEN PROCsave : END
340 UNTIL FALSE
350 :
360 DEF PROCparams
370 C%=7
380 GCOL 0,C%
390 X%=500 : Y%=500
400 ENDPROC
410 :
420 DEF PROCsquare
430 PRINTSPC(18);CHR$(13);
440 INPUT"X:"SQ1%,"Y:"SQ2%
450 PLOT 5,X%+SQ1%,Y%
460 PLOT 5,X%+SQ1%,Y%+SQ2%
470 PLOT 5,X%,Y%+SQ2%
480 PLOT 5,X%,Y%
490 ENDPROC
500 :
510 DEF PROCdetails
520 VDU 13
530 PRINT"X,Y :";
540 PRINTTAB(5);X%;",";Y%;
550 GCOL 0,C%
560 COLOUR C%
570 PRINT TAB(16);"C";
580 ENDPROC
590 :
600 DEF PROCcircle
610 PRINTSPC(18);CHR$(13);
620 INPUT"Radius:"R%
630 MOVE X%+R%,Y%
640 FOR TH%=10 TO 360 STEP 10
650 X1%=R%*COS(RAD(TH%))
```

Notes in the right margin of the listing:

- Lines 10–50: Program details
- Lines 60–90: Set up screen
- Line 100: 'Old' save screens can be loaded here by removing REM from line
- Lines 110–130: Display status line and enable cursor and function to produce ASCII codes keys
- Lines 140–150: Set up main program loop and test for key press
- Lines 160–190: If it was a cursor key, update X,Y co-ordinates
- Lines 200–230: and print in white
- Lines 240–330: If a function key was pressed call appropriate procedure then rewrite status line
- Lines 350–400: Procedure to set up initial parameters
- Lines 410–490: Procedure to draw a square or rectangle of any size from the bottom left vertice
- Lines 500–580: Procedure to display status line
- Lines 600–650: Procedure to draw a circle of any radius (continued overleaf)

Continued ▶

◀ Continued

```
660 Y1%=R%*SIN(RAD(TH%))
670 PLOT 5.X%+X1%.Y%+Y1%
680 NEXT
690 MOVE X%.Y%
700 ENDPROC
710 :
720 DEF PROCline
730 PRINTSPC(18):CHR$(13):
740 INPUT"X:"X1%."Y:"Y1%
750 PLOT 5.X1%.Y1%
760 ENDPROC
770 DEF PROCdot
780 PRINTSPC(18):CHR$(13):
790 INPUT"X:"X1%."Y:"Y1%
800 PLOT 69.X1%.Y1%
810 ENDPROC
820 :
830 DEF PROCdotted
840 PRINTSPC(18):CHR$(13):
850 INPUT"X:"X1%."Y:"Y1%
860 PLOT 29.X1%.Y1%
870 ENDPROC
880 DEF PROCtriangle
890 PRINTSPC(18):CHR$(13):
900 INPUT"LX:"LX%."LY:"LY%."RX:"RX%."RY:"RY%
910 MOVE LX%.LY%
920 PLOT 85.RX%.RY%
930 MOVE X%.Y%
940 ENDPROC
950 :
960 DEF PROCfill
970 PLOT 77.X%.Y%
980 ENDPROC
990 DEF PROCerase
1000 PLOT 95.X%.Y%
1010 ENDPROC
1020 :
1030 DEF PROCcolour
1040 C%=C%+1
1050 IF C%>15 THEN C%=0
1060 COLOUR C%
1070 GCOL 0.C%
1080 VDU 13
1090 FOR L%=1 TO 16 : VDU 9 : NEXT
1100 PRINT"C":
1110 ENDPROC
1120 :
1130 DEF PROCscreen
1140 MOVE 0.50
1150 DRAW 1279.50
1160 DRAW 1279.1023
1170 DRAW 0.1023
1180 DRAW 0.50
1190 MOVE 500.500
1200 VDU 28.0.31.18.31
1210 VDU 24.0;50;1279 1023;
1220 ENDPROC
1230 :
1240 DEF PROCsave
1250 VDU 13
1260 *SAVE SCREEN 3000 8000
1270 ENDPROC
```

Procedure to draw a line of any length from current X,Y position (lines 720–810)

Procedure to plot a point at a specific point (lines 830–870)

Procedure to draw and fill a triangle. The X,Y position marks the apex of the triangle (lines 880–940)

Procedure to fill a line left and right until a different background colour is encountered (lines 960–1010)

Procedure to toggle through drawing colours (lines 1030–1110)

Procedure to draw screen board and define text and graphics windows (lines 1130–1220)

Procedure to save picture design (lines 1240–1270)

See page 45


```
10 REM Listing 1
20 INPUT"Do you want the cassette motor on Y/N "A$
30 N=INSTR(A$,"Y")
40 *MOTOR N
50 GOTO 20
```

Listing 1. Validating keyboard output – but Basic variables cannot be passed to the operating system

```
10 REM Listing 2
20 DIM B 20
30 INPUT"Do you want the cassette motor on Y/N "A$
40 N=INSTR(A$,"Y")
50 $B="MOTOR "+STR$(N)
60 X%=B MOD 256
70 Y%=B DIV 256
80 CALL &FFF7
90 GOTO 30
```

Listing 2. Passing commands and values to the Command Line Interpreter

```
10 REM Listing 3
20 DIM B 20:X%=B:Y%=B DIV 256
30 INPUT"Do you want the cassette motor on Y/N "A$
40 N=INSTR(A$,"Y")
50 $B="MOTOR "+STR$(N)
60 CALL &FFF7
70 GOTO 30
```

Listing 3. Making listing 2 more efficient

```
10 REM Listing 4
20 INPUT"Do you want the cassette motor on Y/N "A$
30 N=INSTR(A$,"Y")
40 OSCLI"MOTOR "+STR$(N)
50 GOTO 20
```

Listing 4. Basic 2 owners can use the OSCLI command

Listing 5. Defining the function keys in Basic 1

```
10 REM Listing 5
20 REM Basic 1 listing
30 MODE1
40 PROCinitialise
50 PROCload
60 PROCfinddef
70 PROCformat
80 INPUT'"Do you wish to define a key "question$
90 IF LEFT$(question$,1)="Y" THEN PROCenter:GOTO60
100 INPUT'"Enter save filename "file$
110 PROCoscli("SAVE "+file$+" B00 BFF")
120 END
130 :
140 DEFPROCinitialise
150 @%=2
160 VDU19,0,4,0,0,0
170 VDU19,3,6,0,0,0
180 DIM A$(15), B 255
185 X%=B:Y%=B DIV256
190 ENDPROC
200 :
210 DEFPROCload
220 INPUTTAB(0,10)"Do you want to load in definitions? "question$
230 IF LEFT$(question$,1)="N" THEN ENDPROC
240 INPUT'"Enter filename "file$
250 PROCoscli("LOAD "+file$)
260 ENDPROC
270 :
280 DEFPROCfinddef
290 length =?&B10
300 FOR N=0 TO 15
310 end=length
320 start=N?&B00
330 a$=""
340 IF start=end THEN GOTO 440
350 FOR n=0 TO 15
360 peek=n?&B00
370 IF peek>start AND peek<end THEN end=peek
380 NEXT n
390 FOR n=start+1 TO end
400 char=n?&B00
410 IF char <32 THEN a$=a$+" ":char=char+64
420 a$=a$+CHR$(char)
430 NEXT n
440 A$(N)=a$+CHR$(13)
450 NEXT N
460 ENDPROC
470 :
480 DEFPROCformat
490 CLS
500 FOR N=0 TO 15
510 COLOUR 1+(N MOD2)
520 PRINT"*KEY"N;
530 FOR n=1 TO LEN(A$(N)) STEP 30
540 PRINTTAB(7) MID$(A$(N),n,30)
550 NEXT n,N
```

Continued ▶

◀ *Continued*

```
560 COLOUR 3
570 PRINT'"There is space for "255-length" characters."
580 ENDPROC
590 :
600 DEFPROCenter
610 INPUT'"Which key "key
620 IF key>15 THEN GOTO 610
630 INPUTLINE'"Enter definition "A$(key)
640 IF length+LEN(A$(key))>255 THEN A$(key)=""
650 PROCoscli("KEY"+STR$(key)+A$(key))
660 ENDPROC
670 :
680 DEFPROCoscli(C$)
690 $B=C$
700 CALL&FFF7
710 ENDPROC
```



```
 10 REM Listing 6
 20 REM Basic 2 listing
 30 MODE1
 40 PROCinitialise
 50 PROCload
 60 PROCfinddef
 70 PROCformat
 80 INPUT'"Do you wish to define a key "question$
 90 IF LEFT$(question$,1)="Y" THEN PROCenter:GOTO60
100 INPUT'"Enter save filename "file$
110 OSCLI"SAVE "+file$+" B00 BFF"
120 END
130 :
140 DEFPROCinitialise
150 @%=2
160 VDU19,0,4,0,0,0
170 VDU19,3,6,0,0,0
180 DIM A$(15)
190 ENDPROC
200 :
210 DEFPROCload
220 INPUTTAB(0,10)"Do you want to load in definitions? "question$
230 IF LEFT$(question$,1)="N" THEN ENDPROC
240 INPUT'"Enter filename "file$
250 OSCLI"LOAD "+file$
260 ENDPROC
270 :
280 DEFPROCfinddef
290 length =?&B10
300 FOR N=0 TO 15
310 end=length
320 start=N?&B00
330 a$=""
340 IF start=end THEN GOTO 440
350 FOR n=0 TO 15
360 peek=n?&B00
370 IF peek>start AND peek<end THEN end=peek
380 NEXT n
390 FOR n=start+1 TO end
400 char=n?&B00
410 IF char <32 THEN a$=a$+"|":char=char+64
420 a$=a$+CHR$(char)
430 NEXT n
440 A$(N)=a$+CHR$(13)
450 NEXT N
460 ENDPROC
470 :
480 DEFPROCformat
490 CLS
500 FOR N=0 TO 15
510 COLOUR 1+(N MOD2)
520 PRINT"*KEY"N;
530 FOR n=1 TO LEN(A$(N)) STEP 30
540 PRINTTAB(7) MID$(A$(N),n,30)
550 NEXT n,N
560 COLOUR 3
570 PRINT'"There is space for "255-length" characters."
580 ENDPROC
590 :
600 DEFPROCenter
610 INPUT'"Which key "key
620 IF key>15 THEN GOTO 610
630 INPUTLINE'"Enter definition "A$(key)
640 IF length+LEN(A$(key))>255 THEN A$(key)=""
650 OSCLI"KEY"+STR$(key)+A$(key)
660 ENDPROC
```

Listing 6. Defining the function keys in Basic 2

See 'Orgmentation', page 74

```
  10 *FX16,1
  20 REPEATnote=FNadc(1)
  30 IF note=0 SOUND&11,0,0,255
  40 IF note>0 SOUND&11,-15,note*4,255
  50 UNTILO
1000 DEFFNadc(x):LOCALa%,b%
1010 REPEAT:a%=(ADVALx+128) DIV 2240
1020 T%=TIME+1:REPEATUNTIL TIME>T%
1030 b%=(ADVALx+128) DIV 2240
1040 UNTILa%=b%:=a%
```

Program 1.
Simple monophonic organ


```
   10 lastnote=0
   20 DIMnote$(28)
   30 FORI%=1 TO 28:READnote$(I%):NEXT
   40 note$(0)=CHR$127
   50 *FX16,1
   60 REPEATnote=FNadc(1):IF note<>lastn
ote PRINTnote$(note);",";:lastnote=note
   70 IF note=0 SOUND&11,0,0,255
   80 IF note>0 SOUND&11,-15,48+note*4,2
55
   90 UNTILO
 1000 DEFFNadc(x):LOCALa%,b%
 1010 REPEAT:a%=(ADVALx+128) DIV 2240
 1020 T%=TIME+1:REPEATUNTIL TIME>T%
 1030 b%=(ADVALx+128) DIV 2240
 1040 UNTILa%=b%:=a%
 1050 DATAC,C#,D,Eb,E,F,F#,G,Ab,A,Bb,B,C
',C#',D',Eb',E',F',F#',G',Ab',A',Bb',B',
C'',C#'',D'',Eb''
```

Program 2.
Music-writing organ

Program 3.
Organ with selectable octaves via F1, F2, F3

```
   10 *FX16,1
   20 octave=1
   30 CLS
   40 PRINTTAB(10,8)"     Octave range"
   50 PRINTTAB(10,9)" F1         F2
F3"
   60 PRINTTAB(10,10)"Low        Mid
High"
   70 PRINTTAB(20,11)"*"
   80 REPEATnote=FNadc(1)
   90 IFnote>25 PRINTTAB(11+octave*9,11)
" "
  100 IFnote>25 octave=note-26:PRINTTAB(
11+octave*9,11)"*"
  110 IFnote>25 UNTILO
  120 IF note=0 SOUND&11,0,0,255
  130 IF note>0 SOUND&11,-15,octave*48+n
ote*4,255
  140 UNTILO
 1000 DEFFNadc(x):LOCALa%,b%
 1010 REPEAT:a%=(ADVALx+128) DIV 2240
 1020 T%=TIME+1:REPEATUNTIL TIME>T%
 1030 b%=(ADVALx+128) DIV 2240
 1040 UNTILa%=b%:=a%
```

Continued ▶

Program 4. Multi-feature organ

```
   10 *FX16,1
   20 octave=1:volume=1:chord=1
   30 CLS
   40 PRINTTAB(9,7)CHR$133"Octaves "CHR$
131"Volume  "CHR$130"Chords"
   50 PRINTTAB(10,9)"F1        F2        F
3"
   60 PRINTTAB(10,10)"low       Piano
Maj"
   70 PRINTTAB(10,11)"High      Forte
Min"
   80 PRINTTAB(10,12)"
Off"
   90 PROCoctave:PROCvolume:PROCchord
  100 REPEATnote=FNadc(1)
  110 IFnote=26 PROCoctave:UNTIL0
  120 IFnote=27 PROCvolume:UNTIL0
  130 IFnote=28 PROCchord:UNTIL0
  140 IF note=0 PROCrest
  150 IF note>0 PROCplay
  160 UNTIL0
  170 DEFPROCchord:PRINTTAB(32,10+chord)
"  "
  180 chord=chord+1:chord=chord MOD3
  190 PRINTTAB(32,10+chord)CHR$(130)"["
  200 REPEAT UNTILFNadc(1)=0
  210 ENDPROC
  220 DEFPROCvolume:PRINTTAB(24,10+volum
e)"  "
  230 volume =volume +1 :volume=volume M
OD 2
  240 PRINTTAB(24,10+volume)CHR$131"["CH
R$135
  250 REPEAT UNTILFNadc(1)=0
  260  ENDPROC
  270 DEFPROCoctave:PRINTTAB(14,10+octav
e)"  "
  280 octave=octave+1:octave=octave MOD
2
  290 PRINTTAB(14,10+octave)CHR$133"["CH
R$135
  300 REPEAT UNTILFNadc(1)=0
  310 ENDPROC
  320 DEFPROCrest:SOUND&11,0,0,255
  330 SOUND&12,0,0,255
  340 SOUND&13,0,0,255
  350 ENDPROC
  360 DEFPROCplay
  370 SOUND&11,volume*-7-7,note*4+octave
*96,255
  380 IFchord=2 ENDPROC
  390 SOUND&13,volume*-7-7,(note+7)*4+oc
tave*96,255
  400 IFchord=0 SOUND&12,volume*-7-8,(no
te+4)*4+octave*96,255:ENDPROC
  410 SOUND&12,volume*-7-8,(note+3)*4+oc
tave*96,255:ENDPROC
 1000 DEFFNadc(x):LOCALa%,b%
 1010 REPEAT:a%=(ADVALx+128) DIV 2240
 1020 T%=TIME+1:REPEATUNTIL TIME>T%
 1030 b%=(ADVALx+128) DIV 2240
 1040 UNTILa%=b%:=a%
```

volume	octave	equivalent SOUND parameters
0	0	&11,–7,note*4,255
0	1	&11,–7,note*4 + 96,255
1	0	&11,–14,note*4,255
1	1	&11,–14,note*4 + 96,255

Figure 9.
Contents of line 370, program 4

Program 5. Organ with record/playback facility

```
   10 *FX16,1
   20 top=0:lastnote=0:mode=0
   30 DIM note%(100),time%(100)
   40 CLS
   50 PRINTTAB(10,8)"     Mode of Action"
   60 PRINTTAB(10,9)" F1         F2
F3"
   70 PRINTTAB(8,10)" RECORD   PLAYBACK
 CLEAR"
   80 PRINTTAB(29,11)"*"
   90 REPEATnote=FNadc(1)
  100 IFnote>25 PRINTTAB(11,11)STRING$(3
0," ")
  110 IFnote>25 PRINTTAB(11+(note-26)*9,
11)"*"
  120 IFnote=26 mode=1:REPEAT UNTILFNadc
(1)=0:UNTIL0
  130 IFnote=27 mode=2:REPEAT UNTILFNadc
(1)=0:PROCreplay:UNTIL0
  140 IFnote=28 mode=0:top=0:REPEAT UNTI
LFNadc(1)=0:UNTIL0
  150 IF mode=1 ANDnote<>lastnote:top=to
p+1:time%(top)=TIME:note%(top)=note:last
note=note
  160 IF note=0 SOUND&11,0,0,255
  170 IF note>0 SOUND&11,-15,48+note*4,2
55
  180 UNTIL0
  190 DEFPROCreplay:LOCALpointer,T:IF to
p=0 ENDPROC
  200 FOR pointer = 1 TO top
  210 IFnote%(pointer)=0 THEN SOUND&11,0
,0,255 ELSESOUND&11,-15,48+4*note%(point
er),255
  220 TIME=0
  230 REPEAT UNTIL TIME>(time%(pointer+1
)-time%(pointer))*.8 OR FNadc(1)=2
  240 IF FNadc(1)=28 pointer=top
  250 NEXT:SOUND&11,0,0,0:REPEAT UNTIL F
Nadc(1)=0:ENDPROC
 1000 DEFFNadc(x):LOCALa%,b%
 1010 REPEAT:a%=(ADVALx+128) DIV 2240
 1020 T%=TIME+1:REPEATUNTIL TIME>T%
 1030 b%=(ADVALx+128) DIV 2240
 1040 UNTILa%=b%:=a%
```

See 'Dumping Secrets', page 86

INSTRUCTIONS FOR USE

1. To use 'Autocol' with your own (or any other) dump:
   a) amend line 100 as necessary.
   b) CHAIN "AUTOCOL".
   c) LOAD and RUN the game or graphics program. (*This can almost certainly not be done by a SHIFT-BREAK using discs.*)
   d) Press the '@' key when you want the dump to occur.
2. To use the ESC L n1 n2 type system:
   a) CHAIN "AUTODMP" (*This is necessary only once. The machine code sections will be saved for you*).

On the second and subsequent occasions:
   b) CHAIN "DUMPER"
   c) LOAD and RUN the game or graphics program. (*This can almost certainly not be done by a SHIFT-BREAK using discs.*)
   d) Press the '@' key when you want the dump to occur.

Program 1. 'Autocol'

```
   10 REM AUTOCOL
   20 REM G.B.Hill (c) JULY 1984
   30 REM To cause any graphics screen t
o be dumped when @ key is pressed.
   40 REM The dump must be a single page
 machine-code dump installed at line 100
   50 PROCassemble
   60 *FX14,2
   70 ?&220=&C0
   80 ?&221=&09
   90 REM Load a one page dump here at &
A00 for disc or &D00 for tape systems.
  100 *LOAD"CANONPJ"
  110 END
  120 :
  130 DEFPROCassemble
  140 REM Operating system addresses
  150 osargs=&FFDA
  160 DIM user 3
  170 REM Locate program
  180 PROCfiling_system
  190 base=&9C0
  200 IF tape THEN dumpstart=&D00
  210 IF disc THEN dumpstart=&A00
  220 IF NOT (tape OR disc) THEN PRINT"C
an't *SAVE, unrecognised filing system."
:VDU7:END
  230 :
  240 FOR PASS=0 TO 2 STEP 2
  250 P%=base
  260 [
  270 OPT PASS
  280 \
  290 \ MAIN PROGRAM
  300 \
  310 .entry         cld
  320                pha:txa:pha:tya:pha
:php   \save registers Y is copied into
A
  330                cmp #64
     \@ key
  340                bne exit
  350                jsr dumpstart
  360 .exit          plp:pla:tay:pla:tax
:pla   \restore registers
  370                rts
  380 ]
  390 NEXT
  400 :
  410 IF P%<>base+&15 THEN PRINT''"You m
ust have made an error in typing in the
piece of code. Please check and try agai
n.":VDU7:END
  420 ENDPROC
  430 :
  440 DEFPROCfiling_system
  450 X%=&80
  460 Y%=0
  470 A%=0
  480 !user=USRosargs
  490 tape=(?user=1 OR ?user=2)
  500 disc=(?user=4)
  510 ENDPROC
```

Program 2. 'Dumper'

```
   10 REM DUMPER
   20 REM G.B.Hill (c) JULY 1984
   30 REM To cause any graphics screen t
o be dumped when @ key is pressed.
   40 REM The machine code is generated
by AUTODMP which must be run before DUMP
ER
   50 *FX14,2
   60 ?&220=00
   70 ?&221=&09
   80 *LOAD"CODE1"
   90 *LOAD"CODE2"
  100 END
```

Program 3. 'Autodump'

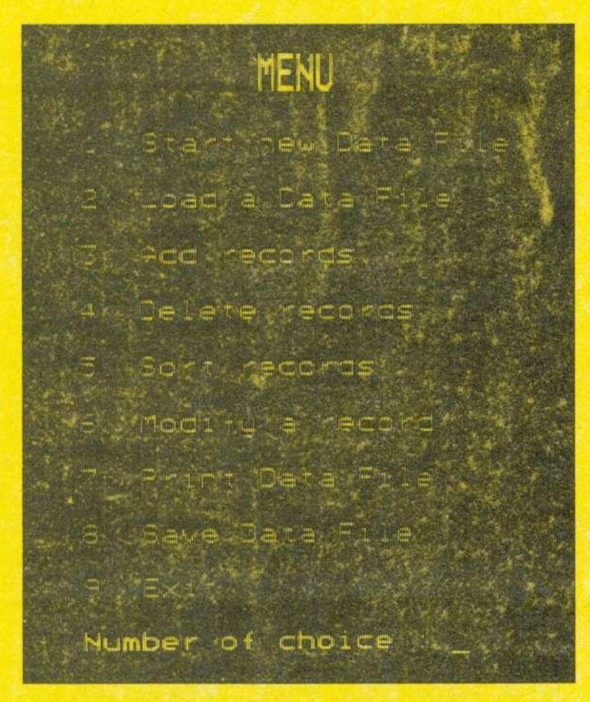
```
   10 REM AUTODMP
   20 REM Copyright G.B.Hill
   30 REM July 1984
   40 REM Version 6
   50 REM Assembly language printer dump
 for all ESC L n1 n2 printers
   60 REM Prints all graphics MODEs
   70 REM MODE0,1,4 in logical colour, M
ODE2,5 in physical colour
   80 REM This program generates two pie
ces of code which are *SAVEd
   90 REM These are then *LOADed by the
BASIC program "DUMPER".
  100 REM The dumps are then activated b
y pressing the @ key.
  110 :
  120 MODE7
  130 REM Operating system addresses
  140 oswrch=&FFEE
  150 osasci=&FFE3
  160 osword=&FFF1
  170 osbyte=&FFF4
  180 osargs=&FFDA
  190 oscli=&FFF7
  200 DIM user 3,cli 30
  210 REM Locate program
  220 PROCfiling_system
  230 base1=&900
  240 IF tape THEN base2=&D00
  250 IF disc THEN base2=&A00
  260 IF NOT (tape OR disc) THEN PRINT"C
an't *SAVE, unrecognised filing system."
:VDU7:END
  270 :
  280 REM Assembler section proper start
s here.
  290 S%=base1
  300 REM reserve space for jump
  310 S%=S%+3
  320 REM Set up constants and variables
  330 REM Xlo,Xhi bytes of X coord: Ylo,
Yhi bytes of Y coord
  340 Xlo=S%:Xhi=S%+1:Ylo=S%+2:Yhi=S%+3
  350 !Xlo=&03FF0000
  360 REM logicol is the byte for osword
 to deposit the logical colour
  370 logicol=S%+4
  380 REM value is the byte where osbyte
 deposits the physical colour
  390 value=S%+5
  400 S%=S%+9
  410 REM Store starting coordinates for
 subroutine setup
  420 XYstore=S%
  430 !XYstore=!Xlo
  440 S%=S%+4
  450 message=S%
  460 $message="Not graphics"+CHR$13+CHR
$(7)
  470 S%=S%+14
  480 lfcontrol=S%
  490 $lfcontrol=CHR$8+"A"+CHR$27
  500 S%=S%+3
  510 bitcontrol=S%
  520 $bitcontrol=CHR$3+CHR$192+"L"+CHR$
27
  530 S%=S%+4
  540 resetcontrol=S%
  550 $resetcontrol="@"+CHR$27
  560 S%=S%+2
  570 REM Storage for various 1 byte var
iables
  580 count4=S%
  590 ?count4=4
  600 pass=S%+1
  610 byte=S%+2
  620 mode=S%+3
  630 stepsize=S%+4
  640 passnumber=S%+5
  650 S%=S%+6
  660 REM Dot patterns for colours
  670 pattern04=S%
  680 !pattern04=&FF00
  690 S%=S%+2
  700 pattern1=S%
  710 !pattern1=&3F260400
  720 S%=S%+4
  730 pattern25=S%
  740 !pattern25=&49841000
  750 !(pattern25+4)=&FF6FB966
  760 S%=S%+8
  770 REM Table of steps, passes and pat
tern addresses for various modes.
  780 patterntable=S%
  790 patterntable!0=&102+&10000*pattern
04
  800 patterntable!4=&304+&10000*pattern
1
  810 patterntable!8=&608+&10000*pattern
25
  820 patterntable!16=&304+&10000*patter
n04
  830 patterntable!20=&608+&10000*patter
n25
  840  S%=S%+24
  850 :
  860 FOR PASS=0 TO 3 STEP 3
  870 P%=S%
  880 [
  890 OPT PASS
  900 \
  910 \SUBROUTINES
  920 \
  930 \Reset X and Y to screen top left
  940 \
  950 .setup          ldx #3
  960 .setuploop      lda XYstore,X
  970                 sta Xlo,X
  980                 dex
  990                 bpl setuploop
 1000 .g_org          lda #26
 1010                 jsr oswrch
 1020                 lda #29
 1030                 jsr oswrch
 1040                 ldx #3
 1050 .g_orgloop      lda #0
 1060                 jsr oswrch
 1070                 dex
 1080                 bpl g_orgloop
 1090                 ldx #2
 1100 .lfloop         lda #1
 1110                 jsr oswrch
 1120                 lda lfcontrol,X
```

```
1130                jsr oswrch
1140                dex
1150                bpl lfloop
1160                rts
1170 \
1180 \Check current mode, if not graphics, issue error message and set carry flag.
1190 \
1200 .modecheck     lda #&87
1210                jsr osbyte
1220                tya
1230                sta mode
1240                cmp #6
1250                bpl wrongmode
1260                cmp #3
1270                beq wrongmode
1280 .rightmode     clc
1290                rol A
1300                rol A
1310                tax
1320                lda patterntable,X
1330                sta stepsize
1340                lda patterntable+1,X
1350                sta passnumber
1360                lda patterntable+2,X
1370                sta select+1
1380                lda patterntable+3,X
1390                sta select+2
1400                clc
1410                rts
1420 .wrongmode     ldy #00
1430 .msg           lda message,Y
1440                jsr osasci
1450                iny
1460                cpy #14
1470                bne msg
1480                sec
1490                rts
1500 \
1510 \Reset printer and send to top of next page.
1520 \
1530 .reset_pr      ldx #1
1540 .resetloop     lda #1
1550                jsr oswrch
1560                lda resetcontrol,X
1570                jsr oswrch
1580                dex
1590                bpl resetloop
1600                ldx #24
1610 .pageloop      lda #1
1620                jsr oswrch
1630                lda #10
1640                jsr oswrch
1650                dex
1660                bne pageloop
1670                lda #3
1680                jsr oswrch
1690                rts
1700 \
1710 \ MAIN PROGRAM
1720 \
1730 .entry         cld
1740                pha:txa:pha:tya:pha:php
1750                cmp #64
1760                bne exit
1770                jsr dumpstart
1780 .exit          plp:pla:tay:pla:tax:pla
1790                rts
1800 ]
1810 :
1820 IF P%<>base1+&FB THEN PRINT''"You must have made an error in typing in the first section of code. Please check and try again.":VDU7:END
1830 :
1840 P%=base2
1850 [
1860 OPT PASS
1870 \
1880 \DUMPING ROUTINE
1890 \
1900 .dumpstart     jsr modecheck
1910                bcc start
1920                rts
1930 .start         lda #2
1940                jsr oswrch
1950                jsr setup
1960 .scan          ldx #3
1970 .ctrl          lda #01
1980                jsr oswrch
1990                lda bitcontrol,X
2000                jsr oswrch
2010                dex
2020                bpl ctrl
2030 .line          lda #0
2040                sta pass
2050                lda mode
2060                bne pixel
2070                lda passnumber
2080                eor #3
2090                sta passnumber
2100 .pixel         lda #4
2110                sta count4
2120 .onebyte       ldx #Xlo MOD 256
2130                ldy #Xlo DIV 256
2140                lda #&09
2150                jsr osword
2160                lda mode
2170                cmp #2
2180                beq physical
2190                cmp #5
2200                beq physical
2210                lda logicol
2220                sta value
2230                jmp logical
2240 .physical      ldx #logicol MOD 256
2250                ldy #logicol DIV 256
2260                lda #&0B
2270                jsr osword
2280 .logical       ldy value
2290                lda pass
2300                and #3
2310                tax
2320 .select        lda pattern25,Y
2330                cpx #0
```

```
2340                     beq rotatein
2350 .rotateout          ror A
2360                     ror A
2370                     dex
2380                     bne rotateout
2390 .rotatein           ror A
2400                     rol byte
2410                     ror A
2420                     rol byte
2430                     sec
2440                     lda Ylo
2450                     sbc #4
2460                     sta Ylo
2470                     lda Yhi
2480                     sbc #0
2490                     sta Yhi
2500                     dec count4
2510                     bne onebyte
2520                     lda #1
2530                     jsr oswrch
2540                     lda byte
2550                     jsr oswrch
2560                     clc
2570                     lda Ylo
2580                     adc #16
2590                     sta Ylo
2600                     lda Yhi
2610                     adc #0
2620                     sta Yhi
2630                     inc pass
2640                     lda pass
2650                     cmp passnumber
2660                     beq incrementX
2670                     jmp pixel
2680 .incrementX         clc
2690                     lda Xlo
2700                     adc stepsize
2710                     sta Xlo
2720                     lda Xhi
2730                     adc #0
2740                     sta Xhi
2750                     cmp #5
2760                     beq eop
2770                     jmp line
2780 .eop                lda #0
2790                     sta Xhi
2800                     lda #1
2810                     jsr oswrch
2820                     lda #10
2830                     jsr oswrch
2840                     sec
2850                     lda Ylo
2860                     sbc #16
2870                     sta Ylo
2880                     lda Yhi
2890                     sbc #0
2900                     sta Yhi
2910                     lda Yhi
2920                     cmp #&FF
2930                     beq finished
2940                     jmp scan
2950 .finished           jsr reset_pr
2960                     rts
2970 ]
2980 NEXT
2990 :
3000 IF P%<>base2+&FF THEN PRINT''"You must have made an error in typing in the second piece of code. Please check and try again.":VDU7:END
3010 PRINT"P%=&";~P%
3020 REM set up jump to entry point
3030 base1?0=&4C
3040 base1?1=entry MOD 256
3050 base1?2=entry DIV 256
3060 :
3070 COM$="SAVE ""CODE1"""+STR$~base1+" +FB "+STR$~base1
3080 PRINT'"SAVING DUMP"''"*";COM$
3090 PROCoscli(COM$)
3100 COM$="SAVE ""CODE2"""+STR$~base2+" +FF "+STR$~base2
3110 PRINT'"*";COM$
3120 PROCoscli(COM$)
3130 END
3140 :
3150 DEFPROCfiling_system
3160 X%=&80
3170 Y%=0
3180 A%=0
3190 !user=USRosargs
3200 tape=(?user=1 OR ?user=2)
3210 disc=(?user=4)
3220 ENDPROC
3230 :
3240 DEFPROCoscli($cli)
3250 X%=cli MOD 256:Y%=cli DIV 256
3260 CALLoscli
3270 ENDPROC
```

See 'Homegrown Database', page 143

Mike Fryer's menu-driven database management program




```
   10 REM  Database management program :
 DBASE
   20 REM  M.J.Fryer
   30 REM  For BBC and Elk
   40 REM (C) Acorn User DEC.84
   50 :
   60 REM DBASE0
   70 :
   80 CLS:MODE 7
   90 REM Allows for 200 records of 6
fields plus keywords. Prints up to 5
records across the page.
  100 record%=200:field%=6:pwidth%=5
  110 DIM d$(record%),d1$(record%),
in%(record%),m%(pwidth%),s%(field%+1),
q$(pwidth%,field%+1),p%(field%+1)
  120 exit%=0:pb%=0:e%=0:f%=0:kw%=0:
nc%=0:f=0:lin$=STRING$(255," ")
  130 ON ERROR REPORT:PRINT" at line ";
ERL:VDU3:CLOSE#f:z=INKEY(200)
  140 REPEAT
  150 PROCmenu
  160 UNTIL exit%=1
  170 CLS
  180 END
  190 :
  200 DEF PROCmenu
  210 CLS:PRINT TAB(16,2);CHR$141;
CHR$131;"MENU":PRINT TAB(16,3);CHR$141;
CHR$131;"MENU"
  220 PRINT TAB(8,5);CHR$130; "1: Start
new Data File"
  230 PRINT TAB(8,7);CHR$130;"2: Load a
Data File"
  240 PRINT TAB(8,9);CHR$130;    "3: Add
records"
  250 PRINT TAB(8,11);CHR$130;"4: Delete
 records"
  260 PRINT TAB(8,13);CHR$130; "5: Sort
records"
  270 PRINT TAB(8,15);CHR$130;"6: Modify
 a record"
  280 PRINT TAB(8,17);CHR$130;"7: Print
Data File"
  290 PRINT TAB(8,19);CHR$130; "8: Save
Data File"
  300 PRINT TAB(8,21);CHR$130;"9: Exit"
  310 PRINT TAB(8,23);CHR$131;"Number of
 choice : ";:n%=GET:n%=n%-48:PRINT;n%
  320 ON n% GOTO 330,340,350,360,370,
380,390,400,410
  330 PROCnew:pb%=0:ENDPROC
  340 PROCold:ENDPROC
  350 PROCadd:ENDPROC
  360 PROCdel:ENDPROC
  370 PROCsort:ENDPROC
  380 PROCmod:ENDPROC
  390 PROCprnt:ENDPROC
  400 PROCsave:ENDPROC
  410 exit%=1
  420 ENDPROC
  430 :
  440 DEF PROCunpak(g%,j%)
  450 :
  460 REM Splits a record into fields
  470 :
  480 LOCAL k%,a$,p%,n%
  490 a$=d$(j%):p%=LEN(a$)
  500 FOR k%=1 TO f%+1
  510 n%=INSTR(a$,"|")
  520 q$(g%,k%)=LEFT$(a$,n%-1):p%=p%-n%
  530 a$=RIGHT$(a$,p%)
  540 NEXT
  550 ENDPROC
  560 :
  570 DEF PROCnew
  580 :
  590 REM DBASE1
  600 REM To start a new data file
  610 :
  620 LOCAL g%,s%,s1%
  630 CLS:PRINT TAB(2,4); "Any existing
 records will be deleted:",TAB(6,6);
"Press ESCAPE to abort":z=INKEY(200)
  640 CLS:REPEAT
  650 PRINT'"How many fields (<";field%+
1;") ";:INPUTf%'
  660 UNTIL f%<field%+1 AND f%>-1
  670 e%=0:s%=255:s1%=0
```

Continued ▶

◀ Continued

```
  680 FOR g%=1 TO f%
  690 PRINT"Length of field ";g%;" ?";:
INPUT SPC(2)p%(g%)
  700 s%=s%-p%(g%)-1:IF s%<1  PRINT"Not
enough space":z=INKEY(100):GOTO 690
  710 NEXT
  720 INPUT'"How many keywords ? "kw%':
IF kw%<1 GOTO 740
  730 PRINT"There are ";s%;" characters
available for"'"keywords: ";: INPUT"How
many do you require "s1%:IF s1%>s% PRINT
 TAB(20)"Too many":GOTO 730
  740 nc%=255-s%+s1%+f%+1:p%(f%+1)=s1%:
lin$=STRING$(nc%," "):mr%=(HIMEM-TOP-
3200)/(2.4*nc%)
  750 PRINT"There is room for about ";
mr%-2;" records":z=INKEY(200)
  760 ENDPROC
  770 :
  780 DEFPROCold
  790 :
  800 REM DBASE2
  810 REM To load a data file from tape
or disc
  820 :
  830 LOCAL g%,k%,f,fm$,nnc%,ee%,ff%,
kkw%
  840 CLS:PRINT TAB(4,2)"To load a Data
File"'' "(The contents will be ADDED to
any"'SPC(4);"existing records)"
  850 INPUT' "Give the name of the Data
File to be"'" loaded: "fm$
  860 INPUT'   "Get tape/disc ready and
press RETURN" a$
  870 f=OPENIN(fm$)
  880 PRINT"File found"
  890 INPUT#f,ee%,ff%,kkw%,nnc%
  900 IF e%>0 AND (ff%<>f% OR kkw%<>kw%
OR nnc%<>nc%)  PRINT"Incompatibility of
records":CLOSE#f:z=INKEY(200):ENDPROC
  910 f%=ff%:kw%=kkw%:nc%=nnc%:lin$=STRI
NG$(nc%," ")
  920 FOR g%=1 TO f%+1
  930 INPUT#f,p%(g%)
  940 NEXT
  950 FOR g%=e%+1 TO e%+ee%
  960 d$=lin$:INPUT#f,d$(g%)
  970 NEXT
  980 IF e%=0 pb%=0
  990 e%=e%+ee%
 1000 CLOSE#f
 1010 PRINT'"There are ";e%;" records."'
"Each has ";f%;" fields and ";kw%; " key
words"
 1020 mr%=(HIMEM-TOP-3200)/(2.4*nc%):
PRINT"There is room for about ";mr%-2;"
records":z=INKEY(200)
 1030 ENDPROC
 1040 :
 1050 DEF PROCadd
 1060 :
 1070 REM DBASE3
 1080 REM To add extra records from the
keyboard
 1090 :
 1100 LOCAL a$,b$,ee%
 1110 a$=lin$:b$=a$
 1120 REPEAT
 1130 CLS:ee%=e%+1
 1140 PRINT TAB(4,2);"Record Number ";
ee%
 1150 a$="":b$=a$
 1160 PRINT TAB(0,4);"Field (Max length)
"
 1170 FOR g%=1 TO f%
 1180 PRINT'TAB(2);g%;" (";p%(g%);") ";
 1190 INPUT LINE b$:IF LEN(b$)>p%(g%)
PRINT"Too long":GOTO 1180
 1200 a$=a$+b$+"|"
 1210 NEXT
 1220 IF kw%>0 PRINT'; kw% ; " Keywords
(separated by commas)": INPUT LINE b$:IF
 LEN(b$)>p%(f%+1) PRINT"Too long (>";
P%(f%+1);")":GOTO 1220
 1230 d$(ee%)=lin$
 1240 d$(ee%)=a$+b$+"|"
 1250 INPUT''TAB(2)"Press RETURN to add
another record,"'TAB(9)  "M for MENU  "
ans$
 1260 e%=ee%:UNTIL ans$<>""
 1270 ENDPROC
 1280 :
 1290 DEF PROCdel
 1300 :
 1310 REM DBASE4
 1320 REM Deletes records
 1330 :
 1340 LOCAL n%
 1350 CLS:PRINT TAB(6,2);"Delete by:"
 1360 PRINT'"1: Record Number"
 1370 PRINT'"2: Keyword"
 1380 INPUT''"Number of choice ",n%
 1390 IF n%=1 PROCdnum:ENDPROC
 1400 IF n%=2 PROCdkey:ENDPROC
 1410 :
 1420 ENDPROC
 1430 DEF PROCdnum
 1440 :
 1450 REM Deletes records by number
 1460 :
 1470 LOCAL pp%,ff%,r%
 1480 CLS:INPUT' "  Range of records to
be deleted"'"  first,last : "ff%,pp%
 1490 r%=pp%-ff%+1
 1500 FOR g%=ff% TO e%-r%
 1510 d$(g%)=d$(g%+r%)
 1520 NEXT
 1530 e%=e%-r%
 1540 ENDPROC
```

Continued ▶

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```
 1550 :
 1560 DEF PROCdkey
 1570 :
 1580 REM Deletes records by keywords
 1590 :
 1600 LOCAL g%,c$
 1610 CLS:INPUT'"Give Keyword for select
ion : "k$
 1620 REPEAT:INPUT'"Delete records with
this Keyword (D), or"' "Include records
with this Keyword (I) :"c$:UNTIL c$="D"
OR c$="I"
 1630 g%=0
 1640 FOR g%=1 TO e%
 1650 PROCunpak(1,g%):PROCsplit
 1660 NEXT
 1670 PROComit:PRINT'"Deletion Completed
":z=INKEY(200)
 1680 ENDPROC
 1690 :
 1700 DEF PROCsplit
 1710 :
 1720 REM Separates the keywords
 1730 :
 1740 LOCAL a$,b$,j%,p%,n%
 1750 in%(g%)=1:a$=lin$:b$=a$
 1760 a$=q$(1,f%+1)
 1770 p%=LEN(a$)
 1780 FOR j%=1 TO kw%
 1790 IF a$=k$ in%(g%)=0: j%=kw%:GOTO
1840
 1800 n%=INSTR(a$,","):IF n%=0 j%=kw%:
GOTO 1840
 1810 b$=LEFT$(a$,n%-1):p%=p%-n%
 1820 IF b$=k$ in%(g%)=0:j%=kw%:GOTO
1840
 1830 a$=RIGHT$(a$,p%)
 1840 NEXT
 1850 ENDPROC
 1860 :
 1870 DEF PROComit
 1880 :
 1890 REM Omits or includes records by
keyword
 1900 :
 1910 LOCAL g%,j%
 1920 g%=0
 1930 FOR j%=1 TO e%
 1940 IF c$="I" in%(j%)=1-in%(j%)
 1950 IF in%(j%)=1 g%=g%+1:d$(g%)=d$(j%)
 1960 NEXT
 1970 e%=g%
 1980 ENDPROC
 1990 :
 2000 DEF PROCsort
 2010 :
 2020 REM DBASE5
 2030 REM Sorts records in alphabetical
order by given field
 2040 :
 2050 LOCAL g%,flg%,dum$
 2060 CLS:dum$=lin$:INPUT'"Sort on which
field ",ans%
 2070 FOR g%=1 TO e%
 2080 PROCunpak(1,g%)
 2090 dl$(g%)=lin$:dl$(g%)=q$(1,ans%)
 2100 NEXT
 2110 REPEAT
 2120 flg%=0
 2130 FOR g%=1 TO e%-1
 2140 IF dl$(g%)>dl$(g%+1) THEN dum$=dl$
(g%+1):dl$(g%+1)=dl$(g%):dl$(g%)=dum$:
dum$=d$(g%+1):d$(g%+1)=d$(g%):d$(g%)=
dum$:flg%=1
 2150 NEXT
 2160 UNTIL flg%=0
 2170 PRINT''"Sort completed":z=INKEY(
200)
 2180 ENDPROC
 2190 :
 2200 DEF PROCmod
 2210 :
 2220 REM DBASE6
 2230 REM To modify a particular record
 2240 :
 2250 LOCAL r%,c%,g%
 2260 CLS:PRINT'"To Modify a record"
 2270 REPEAT:INPUT'"Number of record :"
r%:UNTIL r%>0 AND r%<=e%
 2280 PROCunpak(1,r%)
 2290 FOR g%=1 TO f%+1
 2300 PRINT"(";g%;")",q$(1,g%)
 2310 NEXT
 2320 REPEAT:INPUT'"Number of field :"c%
:UNTIL c%>0 AND c%<f%+2
 2330 PRINT"Type new field",'":";
 2340 INPUT LINE q$(1,c%):IF LEN(q$(1,c%
))>p%(c%) PRINT"Too long":GOTO 2330
 2350 d$(r%)=""
 2360 FOR g%=1 TO f%+1
 2370 d$(r%)=d$(r%)+q$(1,g%)+"|"
 2380 NEXT
 2390 ENDPROC
 2400 :
 2410 DEF PROCprnt
 2420 :
 2430 REM DBASE7
 2440 REM To print/display some or all
the records
 2450 :
 2460 CLS:INPUT'"Range of records to be
output:"'" first,last ( 0,0 for all reco
rds): "ff%,pp%
 2470 IF ff%<1 ff%=1:IF pp%<1 OR pp%>e%
pp%=e%
 2480 IF pb%=1 INPUT'"Repeat Format (Y/N
) ",ans$:IF ans$="Y" OR ans$="y" GOTO
2690
 2490 REPEAT
```

Continued ▶

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```
 2500 INPUT"How many records across scre
en (<5) ",a%
 2510 UNTIL a%<5 AND a%>0
 2520 REPEAT
 2530 INPUT"How many lines between recor
ds ",b%
 2540 UNTIL b%>0 AND b%<30
 2550 FOR g%=1 TO a%
 2560 PRINT"RECORD NUMBER ";g%
 2570 INPUT"Position of Left Margin :
"m%(g%)
 2580 NEXT
 2590 FOR g%=1 TO f%
 2600 s%(g%)=-1
 2610 PRINT"Print Field ";g%;:INPUT" (Y/
N) ",ans$
 2620 IF ans$="Y" OR ans$="y" INPUT"Numb
er of leading spaces :" s%(g%)
 2630 :
 2640 REM Add 100 to combine next field
 2650 :
 2660 NEXT
 2670 INPUT"Print Keywords (Y/N) ",ans$:
s%(f%+1)=-1
 2680 IF ans$="Y" OR ans$="y" INPUT"Numb
er of leading spaces :" s%(f%+1)
 2690 pb%=1: INPUT"Press 'P' to print, '
L' to list "ans$
 2700 IF ans$="P" VDU2:PROCoutput:VDU3
ELSE CLS:VDU14:PROCoutput:VDU15:z=INKEY(
400)
 2710 ENDPROC
 2720 :
 2730 DEF PROCoutput
 2740 :
 2750 REM Formats each output line
 2760 :
 2770 LOCAL g%,j%,k%,p%,sk%
 2780 w%=INT((pp%-ff%)/a%+1)
 2790 index%=ff%-1
 2800 FOR k%=1 TO w%
 2810 FOR g%=1 TO a%
 2820 index%=index%+1
 2830 IF index%>pp% PROCblank ELSE
PROCunpak(g%,index%)
 2840 NEXT
 2850 join%=0
 2860 g%=1:p%=1
 2870 REPEAT
 2880 IF s%(g%)<0 AND join%=0 GOTO2950
 2890 IF s%(g%)>99 OR s%(g%)<0 join%=0:
PROCjoin:GOTO2960
 2900 IF s%(p%)<99 sk%=s%(p%) ELSE sk%=
s%(p%)-100
 2910 FOR j%=1 TO a%
 2920 PRINT TAB(m%(j%));SPC(sk%);q$(j%,
g%);
 2930 NEXT
 2940 IF s%(g%)>-1 PRINT
 2950 g%=g%+1:p%=g%
 2960 UNTIL g%>f%+1
 2970 FOR j%=1 TO b%:PRINT:NEXT
 2980 NEXT
 2990 ENDPROC
 3000 :
 3010 DEF PROCblank
 3020 :
 3030 REM Inserts blank records to fill
up print line
 3040 :
 3050 LOCAL k%
 3060 FOR k%=1 TO f%+1
 3070 q$(g%,k%)=""
 3080 NEXT
 3090 ENDPROC
 3100 :
 3110 DEF PROCjoin
 3120 :
 3130 REM Concatenates fields
 3140 :
 3150 LOCAL s%
 3160 IF s%(g%+1)<0 THEN join%=1:FOR j%=
1 TO a%:q$(j%,g%+1)=q$(j%,g%):NEXT:g%=g%
+1:ENDPROC
 3170 s%=s%(g%+1):IF s%>99 s%=s%-100
 3180 FOR j%=1 TO a%
 3190 q$(j%,g%+1)=q$(j%, g%)+STRING$(s%,
" ")+q$(j%,g%+1)
 3200 NEXT
 3210 g%=g%+1
 3220 ENDPROC
 3230 :
 3240 DEF PROCsave
 3250 :
 3260 REM DBASE8
 3270 REM Saves data to tape/disc
 3280 :
 3290 LOCAL g%,f,fm$
 3300 CLS:PRINT'"To save the data file"
 3310 INPUT'"Give the name for the file
to be saved: "fm$
 3320 f=OPENOUT(fm$)
 3330 PRINT#f,e%,f%,kw%,nc%
 3340 FOR g%=1 TO f%+1
 3350 PRINT#f,p%(g%)
 3360 NEXT
 3370 FOR g%=1 TO e%
 3380 PRINT#f,d$(g%)
 3390 NEXT
 3400 CLOSE#f
 3410 ENDPROC
>
```



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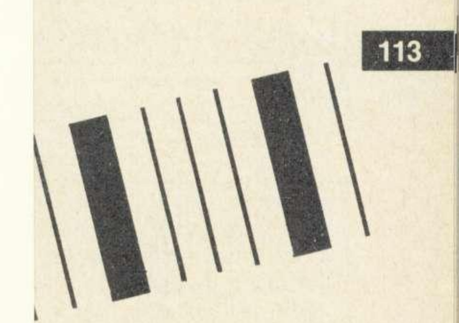
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◀ Continued

```
 2500 INPUT"How
en (<5) ",a%
 2510 UNTIL a%<
 2520 REPEAT
 2530 INPUT"How
ds ",b%
 2540 UNTIL b%>
 2550 FOR g%=1
 2560 PRINT"REC
 2570 INPUT"Pos
"m%(g%)
 2580 NEXT
 2590 FOR g%=1
 2600 s%(g%)=-1
 2610 PRINT"Pri
N) ",ans$
 2620 IF ans$="
er of leading s
 2630 :
 2640 REM Add l
 2650 :
 2660 NEXT
 2670 INPUT"Pri
s%(f%+1)=-1
 2680 IF ans$="
er of leading s
 2690 pb%=1: IN
L' to list "ans
 2700 IF ans$="
ELSE CLS:VDU14:
400)
 2710 ENDPROC
 2720 :
 2730 DEF PROCo
 2740 :
 2750 REM Forma
 2760 :
 2770 LOCAL g%,
 2780 w%=INT((p
 2790 index%=ff
 2800 FOR k%=1
 2810 FOR g%=1
 2820 index%=index%+1
 2830 IF index%>pp% PROCblank ELSE
PROCunpak(g%,index%)
 2840 NEXT
 2850 join%=0
 2860 g%=1:p%=1
 2870 REPEAT
 2880 IF s%(g%)<0 AND join%=0 GOTO2950
 2890 IF s%(g%)>99 OR s%(g%)<0 join%=0:
PROCjoin:GOTO2960
 2900 IF s%(p%)<99 sk%=s%(p%) ELSE sk%=
s%(p%)-100
 2910 FOR j%=1 TO a%
 2920 PRINT TAB(m%(j%));SPC(sk%);q$(j%,
g%);
```

```
 3310 INPUT "Give the name for the file
to be saved: "fm$
 3320 f=OPENOUT(fm$)
 3330 PRINT#f,e%,f%,kw%,nc%
 3340 FOR g%=1 TO f%+1
 3350 PRINT#f,p%(g%)
 3360 NEXT
 3370 FOR g%=1 TO e%
 3380 PRINT#f,d$(g%)
 3390 NEXT
 3400 CLOSE#f
 3410 ENDPROC
>
```






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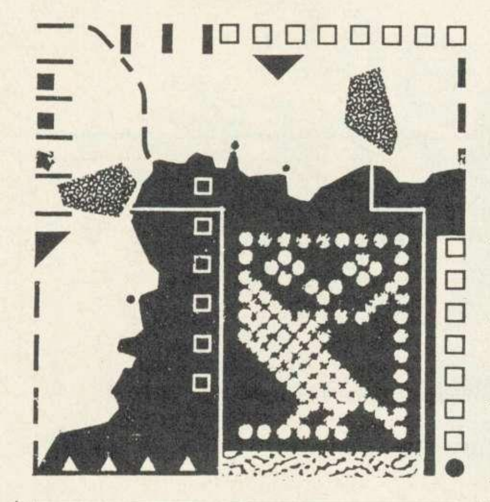
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Easy text window definition and marker deletion, and a slow scroller are among the ideas you bounce off Bruce Smith

£5 Throwing out a challenge

JUDGING by the total lack of response it seems that Beeb Forum readers have been stumped by the challenge I put up a few months ago. But I'm determined not to be defeated so I'll throw it out again in the hope that newcomers to the column will be able to provide the answer.

One of the most common mistakes made in typing programs in is that zeroes and O's and ones and I's tend to get confused. Can anyone supply a transparent program that will interpret an I as a 1 and an O as a zero in a numeric variable and vice-versa when they occur?

£5 Defining text windows

A USEFUL two-liner to help with defining text windows has been sent in by Andrew Mummery of Gravesend. I have to resort to the *Encyclopedia Userguidea* before doing this to establish the correct sequence of the VDU parameters. Andrew writes . . .

The key definitions in the program (listing 1) enable a text window to be defined by two key-presses. After pressing key f8, move the cursor to the required position and then press Return. There will now be a text window from the cursor position to the bottom of the screen. The key can be used repeatedly to position the window progressively lower down the screen. Key f9 restores the default window (ie, the whole screen) and positions the cursor where it was when the key was pressed.

The text window locations are stored in locations &308 to &30B, as noted in the *Advanced User Guide*. By using these locations, the routines will work in any mode, although changing mode will remove the windows.

```
   10*KEY8 Z=GET:VDU28,0,?&309,?&30A,VPO
S+?&30B+1|M
   20*KEY9 Z=VPOS+?&30B-1:VDU26,31,0,Z|M
```

Listing 1. Andrew Mummery's routine for defining a text window in two keystrokes

£5 Easy marker deletion

AS an avid user of *Wordwise*, I have always found having to delete markers 'by hand', as it were, a bit of a pain. However, thanks to D Stiles of Bristol this is now a thing of the past. Mr Stiles sets the scene . . .

One of the frustrating things about *Wordwise* is that the markers are not easily deleted, ie, there is no function key assigned to remove them. The only apparent way is to scroll through the text and delete them using the Delete key or CTRL-A, and then try to find your original place again.

It is possible, however, to delete the markers using the CTRL + Shift keys in conjunction with a function key. Other keys may be set up to perform similar useful functions, and the key set-up saved for future use. Type the following key definitions (only) into *Wordwise* (listing 2), leaving two blank lines at the end. Use menu option 1 to save it to tape/disc. The definitions may be loaded back using *EXEC"" in the menu screen, thus automatically setting up the function keys for use in the text screen.

```
*KEY1¦!!OC27,45,1¦!"
*KEY2¦!!OC27,45,0¦!"
*KEY3@@¦!¦O¦!$¦!#¦A¦!$¦!#¦A¦!¦O¦[5G@@¦M¦M¦[
*KEY6¦!#¦!¦M¦!#¦!'¦!¦M
```

Listing 2. D Stiles' painless way to remove the markers when using Wordwise

In the example given key 1 is set up to give a printer underline code, and key 2 to turn off the underline; key 3 is set up to cancel the markers normally set by this key; and key 6 will delete the text from the current cursor position to the end of the line. The @@ characters are used as a place marker at the start of the cancellation, and are deleted at the end of it using menu option 5.

Other keys may be set up in a similar way. For further details on the coding used see the *Wordwise* manual.

£5 Slow scroller

HAVING been weaned on the Atom I appreciated hearing from a Beeb owner who reads the Atom pages. P Owen of Malvern, Worcs, writes . . .

On looking through the February Atom Forum I was much taken with the Slow Scroller program described there. I felt it would be useful to have a similar facility for the BBC computer.

This program (listing 3) works in the same way by altering the WRCHVEC to point to the routine, which looks for a CR and delays if one is found. The delay is set in line 210 to give a slow scrolling speed of five lines per second. CTRL freezes the display and Shift restarts it. Slow scrolling is enabled by function key 0 while key 1 returns to normal listing.

The program is at the moment placed in Page 9 (&900) but is easily reloca-

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```
10 REM SLOWSCR
20 OSBYTE=&FFF4
30 FOR opt%=0 TO 3 STEP 3
40 P%=&900
50 [OPT opt%
60 LDA #enter MOD &100
70 sta &20E
80 LDA #enter DIV  &100
90 STA &20F
100 JMP end
110 \ normal scrolling
120 LDA #&A4
130 STA &20E
140 LDA #&E0
150 STA &20F
160 JMP end
170 .enter
180 PHA:TXA:PHA:TYA:PHA
190 CMP #13
200 BNEout
210 LDX#20
220 LDY#0
230 LDA #&81
240 JSR OSBYTE
250 CLC
260 CLV
270 JSR &EF02
280 BMI freeze \ ?CNTR key
290 JMP out
300 .freeze
310 CLC
320 CLV
330 JSR &EF02
340 BVC freeze \ ?SHIFT KEY
350 .out
360 PLA:TAY:PLA:TAX:PLA
370 JMP &E0A4
380 .end
390 RTS
400 ]
410 NEXT
420 *KEY0 CALL &900|M
430 *KEY1 CALL &90D|M
```

Listing 3. A slow scroller for the Beeb, by P Owen

table by altering the assignment to P% in line 40 and making the appropriate changes to the function key definitions in lines 420 and 430.

```
32000DEF PROCS:LOCAL A%,@%:@%=6:WIDTH(?&
30A-?&308)DIV6*6:A%=PAGE+4
32010REPEAT IF INSTR($A%,$&705) PRINT A%
?-2+256*A%?-3;
32020A%=A%+A%?-1:UNTIL A%?-3>124:WIDTH 0
:PRINTCHR$8:ENDPROC
```

Listing 4. Procedure by Hallvard Furuseth to search for occurrences of a specific variable or piece of text in a program

£5 Specific searcher

A PROC that enables specific occurrences of text or variables to be found within programs is supplied by Hallvard Furuseth of Norway. Ideally the procedure would be saved by *SPOOLing it as an ASCII file and *EXECing it into your program when required. Mr Furuseth tells the story . . .

I got tired of searching through long programs to find all occurrences of a special variable/text, so I wrote a short PROC (listing 4) that would do it for me. I add it to all long programs I write.

Because of the INSTR bug, OS 1.0 must use:

32010 REPEAT IF LEN$A% > = LEN$&705 IF INSTR (. . .

Everyone should then define:

*KEY 0 |UPROCS ELSE:

Then <KEY0>REPEAT will print out all line numbers where REPEAT occurs. PROCS ELSE: 200 will search for the number 200, PROCS ELSE 200 for the line number.

To search for 'uncompiled' text, use PROCS REM text.

PROCS ELSE: TIME will not find all TIMEs. There is one 'left-hand' TIME (TIME = T%) and one 'right-hand' (T% = TIME). HIMEM, LOMEM, PAGE and PTR behave in the same way. Use PROCS ELSE = TIME to find 'right-hand' TIMEs.

Use TAB(, not TAB. The bracket is part of the name. The same applies to all two or three-argument functions.

A search for TO will also find all TOPs. Sometimes a search for a short text comes up with a line number, because of the special way of storing line numbers. And of course, a search for the variable D will also find AD, D%, DUMMY and so on, and is not of much use.

Line 32000 @% and WIDTH are used for formatting. ?&30A = right hand column of text window, ?&308 = left – at least on my BBC,OS 1.20, 1982. If you don't know these addresses on your BBC, use WIDTH 36. A% points to the text in the first program line.

Line 32010 $&705 is the text searched for. $&700 is the input buffer, 'compiled' into Basic. PROCS ELSE: uses addresses &700-&704. A%?-2 + . . . is the line number of the line into which A% points.

Line 32020 A%?-1 is the length of the line. A% is incremented to point into the next line. If A%?-3 > 124, then the line number > = 32000 (125*256).

ELSE (and DEF and DATA) works in the same way as REM, but the text is not 'compiled' after REM (or DATA). ELSE STOP uses three bytes, REM STOP uses six. The |U deletes everything before PROCS ELSE:, to ensure that the text is located at &705. IF A = 5 PROCS ELSE: AD% would search for "PROCS ELSE: AD%".

£5 Striped answer

IF Beeb and Electron users have ever wondered how and why GCOL parameters in excess of the standard GCOL0,n to GCOL4,n produce funny stripy effects then John Graham-Cumming of Bury St Edmunds has the answer.

Electron-owner John writes. . .

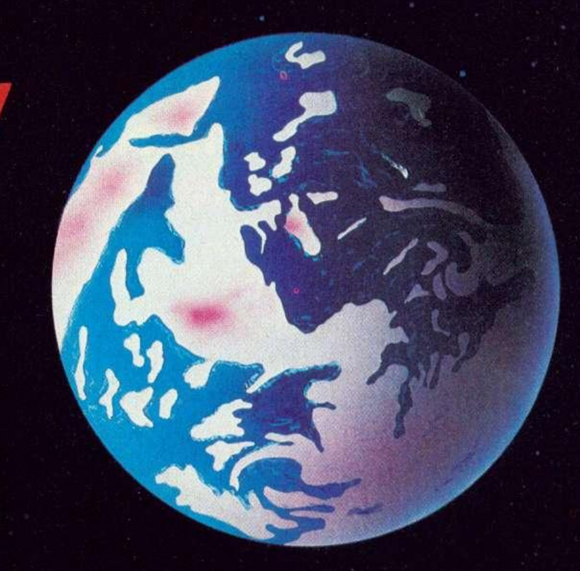
In the Electron user guide, Acorn says that a GCOL command with a high first parameter (greater than 4, eg, GCOL135,1) will produce 'various stripy effects' and although not mentioned in my BBC user guide this also applies to the Beeb.

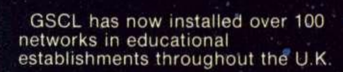
Take GCOL 135,1 as an example. When this command is used, Basic sends 18,135 and 1 to OSWRCH (18 is the Set Graphics Colour code) and the first parameter is stored at &35B (&35C if the background colour is being set). This first parameter should of course be between 0 and 4, but the OS assumes that this parameter is correct and does not check it.

Then, when a plot command is used OSWRCH jumps to the plot routine (&C7AF in OS 1.2) and uses the byte at &35B to get the two graphic colour bytes, stored at &D4 and &D5, from the table. (These two bytes are used as a mask to determine how the points should be plotted.) But since the OS has provision for this only between 0 and 4, the table at &C41B contains only sufficient bytes for these options. The OS reads these bytes using the 6502's indexed addressing mode (Y is loaded from &35B). Thus if a number greater than 4 is used when the OS reads these bytes, they are loaded from outside the table, as in the example. Thus the stripy effects have no set pattern, although it is not random.

So when Acorn says the effects may change with different OS releases the warning should be heeded since the tables need not be in the same order, and the effects would change. Those wishing to write programs that will run on all BBCs and Electrons should avoid these effects. They are fun to use, though, and need not be avoided for your own enjoyment.

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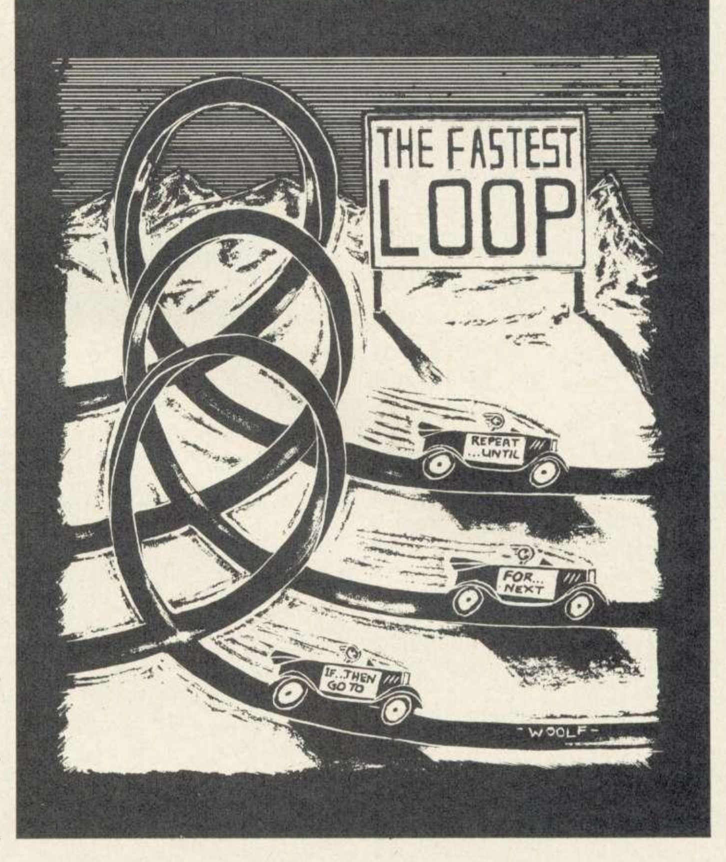
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WHEN SPEED IS OF THE ESSENCE

Speedy Paul Beverley sets the pace for your micro



COMPARED with many other micros, the BBC is a very fast machine, as demonstrated by the summary of the PCW Basic benchmark tests (table 1). Even the Sinclair QL, with its 32-bit processor can beat the Beeb only on benchmark 8 – the trigonometrical calculations test. On average, over all the tests, the BBC is 60 per cent faster than the QL.

Nevertheless, if you've got to do a job in which speed is of the essence, and you already have a BBC micro, (or an Electron, for that matter), the important thing is to see if there are ways of making it work even faster. So in this article, I'll look at a selection of methods of speeding things up, mainly by improving programming techniques, but also discussing one or two hardware techniques.

For Electron owners, the programming techniques will be equally applicable, since Electron Basic bears a remarkable resemblance to Basic II on the BBC. On the hardware side, though, the remarks will be specifically for Beeb owners.

Gary Smallridge's article in the June issue gave a number of ways of increasing speed when working in Basic. In case you missed it, there's a summary of the points made, supported by various timings (tables 2 to 4), plus a few extra notes added in the light of further experience. All timings were done using an external digital timer, with interrupts on the micro having been disabled. This increases the speed slightly, but is done because it makes the time values obtained constant, ie, they're not affected by the frequency with which interrupts occur during the timing period.

Points to note

1. If the loop tests in table 2 are run using the number 1000 rather than the variable A%, which had previously been set to 1000, then in the case of the FOR . . . NEXT loop it hardly makes any difference to the timings. This is because the line containing the FOR statement is only interpreted *once*. The other two loop structures, however, are slowed down to 2.03 and 2.38 seconds respectively. This is because the line containing the exit condition with either the 'A%' or the '1000' is interpreted *every time* the loop is executed, which, of course, is what makes these two structures slower than the FOR . . . NEXT loop.

2. Another interesting point about the looping structures is that although, in the IF statement, you can use either THEN or GOTO, it's in fact quicker to use THEN. Changing THEN into GOTO in the test example increases the timing by two per cent to 1.96 seconds.

3. It was pointed out by Robert Tidey in a letter in the August issue that although Gary's timings appeared to show that it's quicker to use GOSUBs

- FOR . . . NEXT is the fastest loop mechanism, REPEAT . . . UNTIL is next fastest, and IF . . . THEN GOTO the slowest (table 2). (See Points to note 1.)
- Always use integer variables (A%, B%, etc) wherever possible rather than floating point variables (table 3 b/c, d/e, f/g).
- The resident integer variables (@% to Z%) are faster than other single letter integer variables (table 3b).
- Use short variable names, all starting with different initial letters if possible (table 3 b,c).
- Multi-statement lines speed up interpretation of a program, though they reduce readability (table 1 a/b).
- In calculations, take out any common factors, ie, A/B + C/B takes longer to work out than (A + B)/C.
- Use multiplication rather than division, eg A * 0.01 is quicker than A/100, (table 3 d,e,f,g).
- In anything other than the shortest of programs, procedures are faster than GOSUBs. (See Point 3.)
- Blank lines and REM statements aid readability, but slow down the interpretation (table 3 a).
- Always use variables (integer if possible) for any constants that are used repeatedly, since it's quicker for Basic to look up the value of a variable than to re-interpret the value (table 3 d,e,f,g).

Summary of points from June issue

Computer	Processor	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Average
BBC	(6502)	0.6	2.7	7.8	8.3	8.8	13.2	20.7	4.99	8.4
Electron	(6502)	0.9	3.7	10.7	11.4	11.9	18.2	28.1	7.1	11.5
QL	(68008)	1.9	5.5	9.4	9.2	11.8	24.1	43.0	2.1	13.4
380Z	(Z80)	1.4	6.5	13.2	13.9	15.0	22.3	31.6	6.2	13.8
MZ80 B	(Z80)	0.6	5.0	12.0	19.0	20.0	27.5	38.0	5.0	15.9
VIC-20	(6502)	1.4	8.3	15.5	17.1	18.3	27.2	42.7	9.9	17.5
Atom (INT)	(6502)	0.8	5.5	10.0	11.5	14.5	20.0			
(F.P.)						30.5	27.0	30.0	26.0	17.7
Apple II	(6502)	1.3	8.5	16.0	17.8	19.1	28.6	44.8	10.7	18.4
PET	(6502)	1.7	9.9	18.4	20.4	21.0	32.5	50.9	12.3	20.9
ZX81	(Z80)	4.5	6.9	16.4	15.8	18.6	49.7	68.5	22.9	25.4
Atari	(6502)	2.3	7.4	19.9	23.2	26.8	40.7	61.5	43.1	28.1
Spectrum	(Z80)	4.8	8.7	21.1	20.4	24.0	55.3	80.3	25.3	30.0

Table 1. Results of the PCW Basic benchmarks tests

than PROCedures, it's true only for *short* programs. As the program gets longer, the PROCedures take exactly the same length of time, whereas the subroutines get slower and slower. Those of you with long memories may recall that this was pointed out in one of the very first issues of *Acorn User*, back in December 1982, in an article entitled 'Probing procedures', since reprinted in 'Programming tips for the BBC micro' published by Addison-Wesley.

Clearing the screen

It's worth noticing the considerable difference in time taken to clear the screen using CLG instead of CLS or MODE (table 4). This is because CLS simply wipes the memory locations in numerical order, whereas CLG uses the fill routines to fill the screen with the background colour.

Stop interrupting!

If you're doing some calculations and want to save yourself a few valuable milliseconds or microseconds, then it's possible to disable the interrupts which occur regularly and which the BBC micro uses to do various housework jobs, like up-dating the ADVAL values or the value of TIME. The ADC interrupts can easily be disabled with no ill effects by using *FX16,0 and this will speed things up by 1.2 per cent. To disable the other interrupts as well saves even more time, but is a bit riskier.

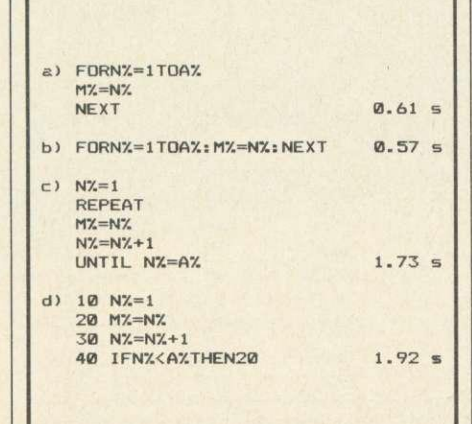
All of the regular interrupts are routed through the system VIA – the 6522 versatile interface adaptor which is memory-mapped at &FE40 to &FE4F. To disable these interrupts, all you need do is to write to the interrupt enable register at &FE4E. Thus to switch all the interrupts off, you could use:

?&FE4E = 127

but to make it look a little less illegal (!) you could use:

```
 10 ONERROR GOTO 160
 20 *KEY0RUN M
 30 P%=&FE61
 40 A=10
 50 A%=100
 60 B=10
 70 B%=10
 80 C=0.1
 90 *FX151,78,127
100 ?P%=0:?P%=1
110 REM LINE UNDER TEST
120   ?P%=0:?P%=1
130 *FX151,78,255
140 END
150 :
160 REM ERROR ROUTINE
170 *FX151,78,255
180 REPORT
190 PRINT " AT LINE ";ERL
```

Program 1. Test program used to do all the time measurements with the interrupts disabled – the two extra spaces in line 120 are used to add a small delay so that, when there is no test line, the time registered on the external timer is exactly 1.00 milliseconds. This can then simply be subtracted from the value registered when the line or lines under test are inserted



```
a) FORN%=1TOA%
   M%=N%
   NEXT                          0.61 s

b) FORN%=1TOA%:M%=N%:NEXT        0.57 s

c) N%=1
   REPEAT
   M%=N%
   N%=N%+1
   UNTIL N%=A%                   1.73 s

d) 10 N%=1
   20 M%=N%
   30 N%=N%+1
   40 IFN%<A%THEN20              1.92 s
```

Table 2. Timings of looping structures (A% = 1000)

*FX 151,78,127

and then to switch them all back on again, you can use:

?&FE4E = 255 (or *FX 151,78,255).

This also disables the ADC inputs, so there's no need to use *FX 16,0 as well. If you do this you'll find that all your routines will run another 3.3 per cent faster, making a total saving of 4.5 per cent.

A word of warning. Your program *must* include effective error-trapping in order to switch the interrupts on again in the event of an error (program 1). If the interrupts are switched off, it means that the keyboard is disabled, so you can't type in anything after an error has occurred. The natural reaction then, is to press the break key to regain control of the machine. Unfortunately if you do this your program will disappear as if by magic! This is because one of the first things the operating system does when the break key is pressed is to check the interrupt enable register of the internal VIA. If it contains zero (ie, no interrupts are enabled), it assumes that this must have been a power-up reset, and the first thing it does therefore is to wipe the contents of the memory from &400 to &7FFF – which includes the whole of your program!

Even with error-trapping, you could still lose your program. If there's a logical error in it so that it gets into a loop while the interrupts are disabled, there's no way out. Escape is disabled, and break causes a memory wipe! The answer, therefore, is to debug the program thoroughly first and *then* add the line which disables the interrupts.

Hardware techniques

On the hardware side, the first thing to note is that if your program needs any form of timing, then hardware timers are available in the two VIAs. This means that instead of using a software loop so that the processor is idling during the time period, the VIA timer



can be started and can produce an interrupt when the timing is finished, allowing processing to continue during the timing period. The only disadvantage of this is that it means using machine code programming and having an understanding of the workings of the VIA.

The other possibility, which is simpler but only enables you to time in centiseconds, is to use the elapsed time clock provided by the operating system, using one of the hardware timers on the internal VIA. This is accessible through OSWORD calls 3 and 4 as explained on page 460 of the *User Guide*. However, you can't use this method of timing if you are also speeding up by disabling interrupts, since the elapsed time clock is interrupt driven.

High-speed interfacing

If you're involved in interfacing and want to work that extra bit faster and you're using the 1MHz bus, it's worth knowing that there are links on the PCB which can be used to speed up this interface to 2MHz. Unfortunately there is a PCB error, which has been perpetuated right up to issue seven boards, which means that you have to break a track going to one of the ICs rather than the actual piece of track which makes the link (S16). Details of exactly how to do this are given in *Electronics and Computing Monthly*, December 1983.

It's also possible, even though there are no actual PCB links, to double the speed of the user port and printer port. This requires the replacement of the external 6522 VIA with a 6522A (the 2MHz part), and also involves the breaking of one track plus the addition of a solder bridge (see above article).

The other effect of using the 6522A is to double the speed of the VIA timers, which improves their resolution when used to set delay times or to measure elapsed times. If you think you're good at Acornsoft's *Snapper* program, try playing it on a BBC micro fitted with this modification.

Another piece of hardware information that's worth knowing from the speed point of view is that it's possible

```
a) REM                          0.06
   REM THIS IS A COMMENT        0.14

b) M%=10                        0.51
   m%=10                        0.84
   number%=10                   1.09

c) M=10                         1.04
   m=10                         1.03
   number=10                    1.27

d) M%=100+10                    0.92
   M%=100*10                    1.12
   M%=100/10                    2.74

e) M=100+10                     1.38
   M=100*10                     1.65
   M=100/10                     2.81

f) M%=A%                        0.43
   M%=A%+B%                     0.64
   M%=A%*B%                     0.85
   M%=A%/B%                     2.47

   M%=A%MODB%                   1.38
   M%=A%DIVB%                   1.39

g) M=A                          0.88
   M=A+B                        1.39
   M=A*B                        2.26
   M=A/B                        2.45
```

Table 3. Results of timing tests given in milliseconds of the interpretation by Basic of various program lines (Interrupts disabled) (A% = A = 100, B% = B = 10)

to get spurious pulses on the keyboard interrupt line. This occurs mainly when the keyboard links, which are read on the keyboard matrix lines, are being used. What happens is that when a spurious pulse appears, it causes an interrupt. The operating system then checks the keyboard to see which key has been pressed and returns when it discovers that none actually is.

To the user there is no visible effect,

N	MODE N	CLS	CLG
0	53.6	51.1	538.8
1	54.2	51.1	527.9
2	54.9	51.1	522.7
3	44.0	41.2	(0.2)
4	29.0	26.3	319.5
5	29.3	26.3	308.4
6	24.2	21.3	(0.2)
7	6.2	3.9	(0.2)

Table 4. Timings in milliseconds for clearing the screen in different ways in various modes. Those in brackets are not significant since they refer to text-only modes

but the time spent servicing the phantom interrupt is wasted time which will reduce the overall speed of the processor.

To test whether this is a problem on your machine, run the following program:

```
10TIME=0
20FORN%=1TO500000
30NEXT
40T%=TIME
50PRINT T%/100
```

Be careful to type it in without adding spaces in lines 20, 30 or 40. You should get an answer of 88.06 if you are using Basic 1 and 88.11 for Basic 2. On a model A or a model B with ADC interrupts disabled the times should be 86.98 or 87.03 respectively.

If the timing is somewhat longer than expected, then the problem may be the phantom keyboard interrupts mentioned above.

The solutions suggested by Acorn are first to replace the eight 10k pull-up resistors on the keyboard PCB with 2k2 resistors, (later models will already have 2k2 resistors fitted), and second, to solder a 560 pF capacitor between pins 7 and 8 of the 74LS30 integrated circuit on the keyboard PCB.

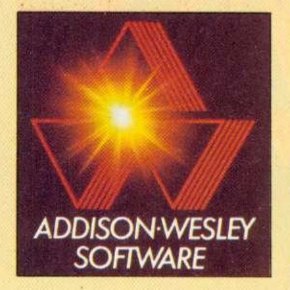
This has the effect of smoothing out any tiny spikes that might occur on the line that goes to the VIA to generate the keyboard interrupts.

Going faster still

If you want to work even faster than the suggestions in this article allow, you need to learn a bit about machine code programming. The good thing about the BBC micro and the Electron is the ease with which you can combine machine code and Basic. You decide which parts of your program are taking up the most time and write a machine code routine or routines to do just that critical part of the program. These routines should not be too complex and can then be called from within the Basic program. This kind of 'hybrid' programming really does make the Beeb a good machine to use when speed is of the essence!

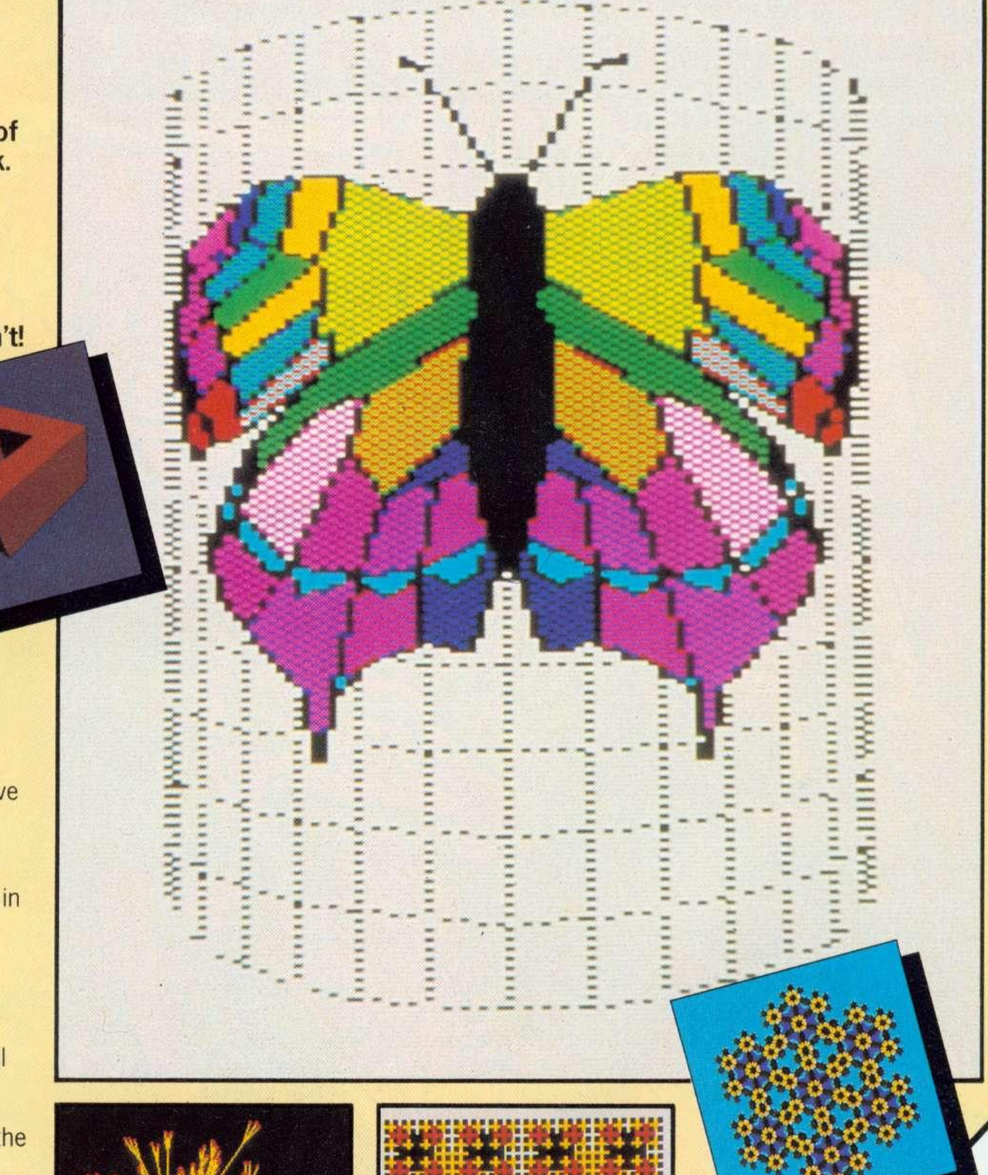


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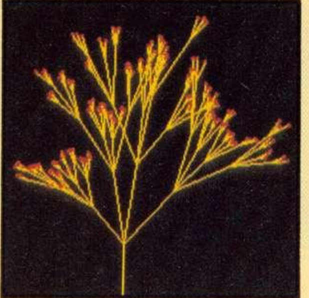
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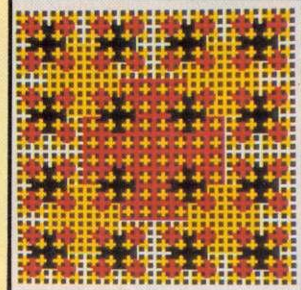
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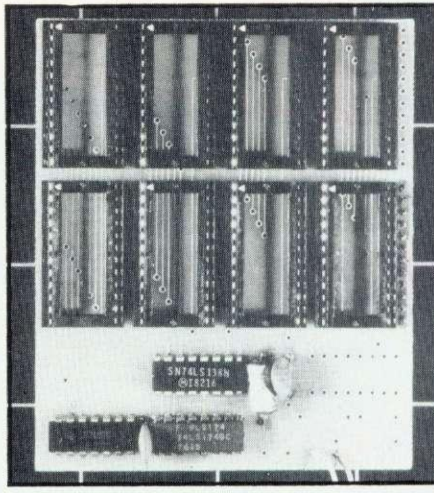
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DIY ROM PAGER

Construct a useful addition to your Atom with Alan Knowles


The finished ROM pager board

THE first big task I attempted on my Atom was a machine code monitor program and disassembler, which I blew into EPROM and installed in the utility ROM socket (C24) at address #A000-#AFFF. I soon realised that I needed other utility ROMs as well, to enhance the Atom's facilities and allow wordprocessing and so on. As they all required to be located in socket C24, I obviously needed to be able to switch (preferably by program) between several ROMs sharing the same addresses.

A ROM pager was therefore designed within the following constraints:

- It should be accommodated within the Atom case.
- It should involve an absolute minimum of wiring on the Atom PCB.
- One of eight EPROMs should be selectable by program and, if desired, a specific one should automatically be selected on power-up or on using the Break key.

The first two were easily dealt with. When my prototype had been tested, a small printed circuit board containing eight 24-pin sockets for the EPROMs and 24 pins to plug into C24 socket was designed with all the address lines from – and all the data lines to – socket C24 being connected to all eight EPROM sockets.

The third constraint was more difficult. The chip-enable signal on pin 20 of IC24 needed routeing to only one selected EPROM, the remaining ones being left disabled. The circuit diagram in figure 1 shows how this is achieved. The number of the currently selected EPROM is stored in the 74LS174 latches and decoded by the 74LS138, which selects only one of the eight EPROMs when the chip-enable signal on pin 20 of IC24 socket is activated. The latch flip-flops are all reset by NRST (from near R41 on the Atom PCB – figure 2), which is generated on power-up and when the Break key is operated. The decoder then routes the chip-enable signal to EPROM number 0.

The mechanism for entering the number of the selected EPROM into the 74LS174 latches may be of interest. Minimal external connections was one of the initial constraints and thus use had to be made of signals already going to IC24 as far as possible. How could the latch be addressed? The answer, of course, is simple. No program should ever need to write to a part of the address space occupied by read-only memory. So the act of writing to addresses in the range #A000-#AFFF could be used to load the latches.

The chip-enable signal on pin 20 of IC24, together with the write signal NWDS (brought in by a wire from near to PL4 – figure 2), provide a suitable strobe signal when combined by the 74LS02 gate. The obvious source of information for the latches is the data bus onto which the EPROM's place their data when enabled.

Herein lies a problem. If an EPROM is driving the data bus and the 6502 CPU chip is trying to write data via the data bus to the ROM, which will win? The data bus levels will be ill-defined at this time and will be unsuitable for loading into the latches. Thus the least

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PL4
NWDS
ROM PAGER BOARD
IC 24
R41
NRST
R39

Figure 2. Location of flying leads on the PBC

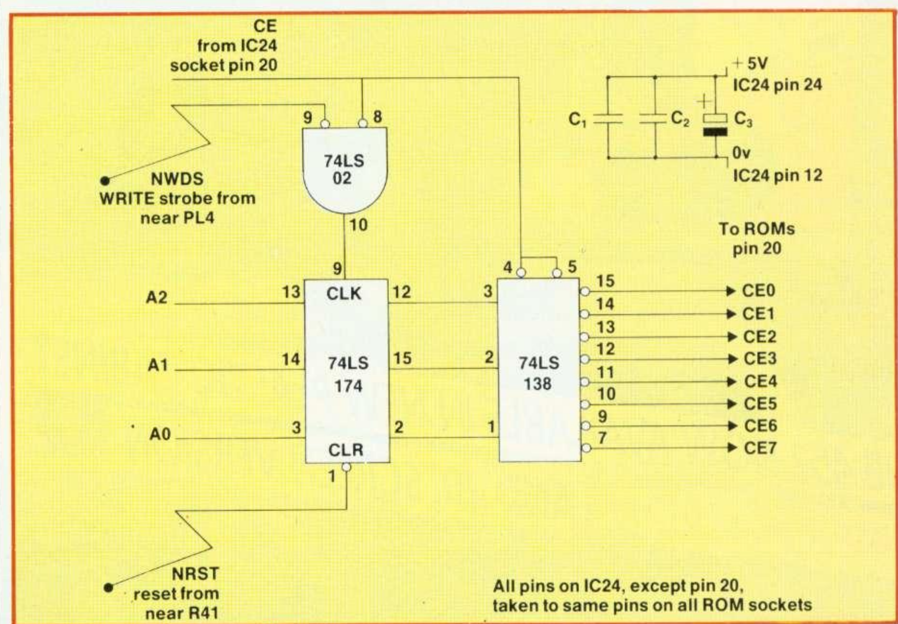


Figure 1. Circuit diagram of eight-way ROM pager

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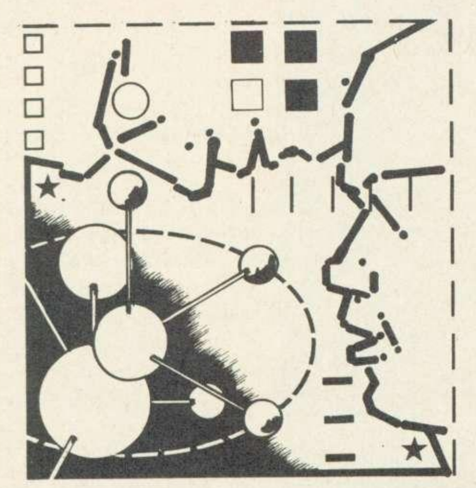
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A hidden line routine, joystick conversion, dumping garbage and BBC Basic compatibility are Barry Pickles' Atomic topics this month

£10 Hidden line routine

THIS hidden line routine (listing 1) from E Paijmans of Amersfoort, Holland, works with two arrays. In these arrays the highest and lowest Y co-ordinate at certain X co-ordinate is stored.

The program works in graphics mode 4. It changes the plot routine vector so when you want to plot a point every point is examined first, and when it lies between the minimum and maximum value it isn't plotted. The program may be used in combination with the 3D program on page 83 of the Atom manual. To make it work properly change lines 70 and 200 as follows:

```
70 Z=0; GOSUB 9000
200 FOR U=20 to -20 STEP-1
```

Mr Paijmans' routine earns him £10

```
9000 P.$21;DIM LL2
9010 FOR I=0 TO1; P=#3900
9020[
9030\*************************
9040\**                     **
9050\** HIDDEN LINE ROUTINE **
9060\** FOR X,Y,Z SURFACE   **
9070\**                     **
9080\*************************
9090\
9100: LL0 LDX #5A     X-COORD.
9110      LDA #5C     Y-COORD.
9120      CMP #3A00,X MAX-ARRAY
9130      BCC LL1
9140      STA #3A00,X UPDATE MAX
9150      JSR #F7AA   MODE4 PLOT
9160      LDX #5A     X-COORD.
9170      LDA #5C     Y-COORD.
9180: LL1 CMP #3B00,X MIN-ARRAY
9190      BCC LL2
9200      RTS
9210: LL2 STA #3B00,X UPDATE MIN
9220      JMP #F7AA   MODE4 PLOT
9230]
9240 NEXT; P.$6; D=#C0C0C0C0
9250 FOR I=0 TO 255 STEP 4
9260 I!#3B00=D; I!#3A00=0; NEXT
9270 !#3FE=#3900; ?#B000=#F0;R.
```

Listing 1. Hidden line routine from E Paijmans of Holland

£5 BBC Basic compatibility

MICHAEL LACEY of Retford has just bought a BBC Basic board to fit his fully expanded Atom and asks the following questions.

1. Can I run BBC software or hardware (16k or 32k) on it?
2. Are there any books to help me convert them?
3. Are there any games that run on both?
4. Will a colour board work?

. . . To answer the points as they are raised:

1. No, you can't run BBC tapes with this board, as the cassette operating system format is quite different. You can run BBC software listings provided they are all in Basic, you do not use the hardware features of the Beeb, and you have enough memory.
2. We ran a short series on converting BBC Basic to the Atom earlier this year (see page 125 of last month's issue and earlier back numbers).
3. No, because of the COS.
4. Strictly speaking, the colour board would not work, since neither GCOL or COLOUR are supported. However, you can actually use it by poking the appropriate values into port B of the 8255 (see the Atom manual).

£5 Joystick conversion

IS there any software or hardware to convert my Atom games (Acornsoft, A&F, Program Power, etc) to run with a joystick? asks Philip Arkley of Accrington. He wants to know so that he can decide whether it is worth buying a joystick and interface.

I don't know of any commercial company making a joystick interface for the Atom, but it really is very easy to do, using the VIA and user port B. Essentially, switched (Atari-type) joysticks contain five switches, one for each compass direction and one for the fire button. The Atom technical manual shows you how to sense the state of switches attached to the user port, and reading each switch is a matter of masking the appropriate bit(s) at #B800.

The software is another matter. If the keys are read by a Basic routine, there is no problem – just replace the routine with yours. However, most commercial software uses machine-code to read the keyboard and here you must first find the routine (by using a disassembler) and replace it with a JSR to your own machine-code. This assumes also that there is sufficient space left in memory to accommodate your own routine. As you can imagine, all this

page 129 ▶

Invented a routine or discovered a hardware modification for the Atom? Here's a chance to show your originality and win some cash. Send your idea to: Atom Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2 9JH.

◀ page 125
significant three bits on the address bus are used instead. Writing any data to address #A000 selects EPROM 0; #A001 selects EPROM 1, etc. This may be done in Basic (?#A001=0) or in machine code (STA #A001). It doesn't matter what is in the A register as the data is ignored.

My original design was constructed using veroboard and this operated reliably for some time, but it was fiddly to make and in due course a PCB was produced which meant that construction is now only a matter of soldering in the sockets (the 74LS174, 138 and 02 chips may be socketed or soldered in place). The only difficulty encountered was the procurement of suitable pins to plug into IC24 socket.

Care must be taken not to use pins of too large a diameter as these will strain the IC24 socket, making it useless for its original purpose. Wirewrap pins are therefore unsuitable. The best solution seems to be to purchase a 24-pin turned pin socket. This socket should be cut into two narrow 12-pin strips into which short lengths of bare wire should be soldered. These wires are now used to solder the strips onto the underside of the PCB before the eight 24-pin sockets are mounted. Take care not to short together printed tracks passing between pins.

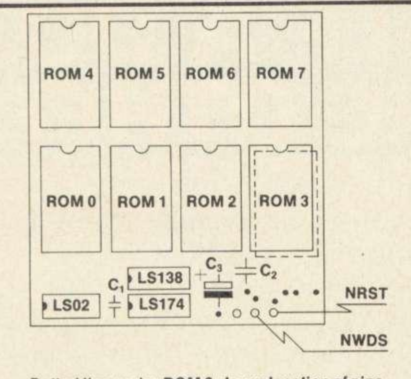


Figure 3. PCB layout

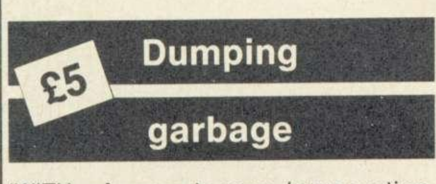
Flying leads carrying NWDS and NRST between the Atom PCB and the pager board can either be soldered into place or pins and clips used to permit easier removal of the pager board.

The extra IC position that may be seen on the board is for a 74LS123 monostable and associated components, which I use to generate an IRQ interrupt request whenever NRST is activated. This is used to initialise my monitor ROM which, being in position 0, is automatically selected.

To assist in the construction of the ROM pager, the author is supplying the bare glass-fibre printed circuit board (two-layer, drilled plated-through-hole). Orders should be sent direct to: A E Knowles, 15 Belgrave Avenue, Flixton, Manchester M31 2SR, enclosing a cheque for £4.50, which covers P&P.

◀ page 127
requires a fair degree of familiarity with machine-code.

I have converted a number of commercial programs, but some of them do not leave enough memory free for succesful conversion. In the end, the value of doing this depends on the user but, if there's sufficient interest I'll write an article giving some methods of conversion.



'WITH reference to your dump routine, listing 1, page 127, September issue, I looked forward to a very useful screen dump routine for my Centronics printer 739-2L,' writes P Ringwald of London NW9. 'All I got printed out after typing RUN is as detailed below (figure 1).

'Are there special conditions where it might work? The printer and Atom work perfectly in conjunction with *Wordpack*.'

Oh dear! This was one of those rare occasions where the listing was not produced from a running program. Line 1020 should read:

```
1020 F.N=0 TO #1740 S.192
```

My apologies to Mr Ringwald and other 739 users.

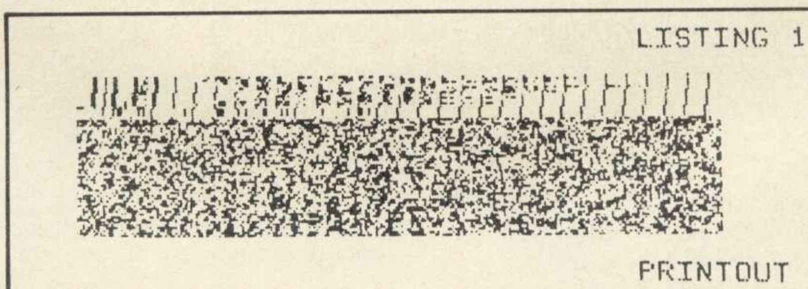


Figure 1. 'Garbage out' from a Centronics 739, submitted by P Ringwald

ATOM COMPETITION

HERE's a great chance for all you Atom users to show off your talents – and win some nice prizes into the bargain. This competition is for the Atom only, so, for once, you won't be overshadowed by the Beeb!

The competition is quite simple and should give a chance to users at every level of competence. All we want you to do is to write a graphics demonstration. It can be anything you like – a still picture, an animated sequence or just a sequence of pretty patterns. The only requirement is that moving displays should last for at least 10 seconds. Your program should run on a 'standard' Atom, which for the purposes of this competition is defined as no more than 5+6k RAM, with no 'toolbox' or other extension ROMs and no additional hardware. The FPROM and the VIA are allowed, however.

Entries should be sent on cassette, preferably accompanied by a listing (tapes cannot be returned, however). The competition will be judged on both artistic merit and programming skill and the editor's decision is final.

There will be three winners, who may each take their pick of one of the following prizes:

- The Bearsoft Editor (WP) ROM
- SuperBasic ROM
- Millipede & Night Driver games tapes

Closing date for entries is Friday, January 4, 1985 and these should be sent to Atom Competition, *Acorn User*, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

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4 DOUBLE-DOS

Double density disc interface for the BBC computer.

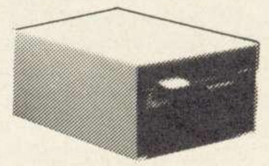
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All of our disc drives are double density spec. and therefore if used in conjunction with DOUBLE-DOS give twice the standard Acorn disc capacity and feature head load light. Single drives are supplied in a double case to allow easy addition of a second drive.

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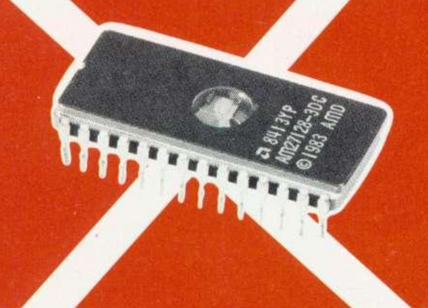
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Requires Merlin Double Dos.

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G:FORTH

Language



G:FORTH - is an advanced implementation of FORTH

G:FORTH - follows the 79-standard specification

G:FORTH - has the full double-number extension set

G:FORTH - has extremely fast Turtle graphics

G:FORTH - includes an Editor and a 6502-Assembler

G:FORTH - supports extensive string and file handling

G:FORTH - allows the use of all screen modes

G:FORTH - contains more than 540 predefined words

G:FORTH - can be used with either tape or 40/80 track disk systems

G:FORTH - is ideal for scientific and professional applications:

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- advanced colour graphics

G:FORTH - provides words that can be used to:

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- produce sounds
- set & read the time
- produce random numbers

G:FORTH - reduces program development time and inspires a structured and creative way of solving problems

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For the BBC Microcomputer model B

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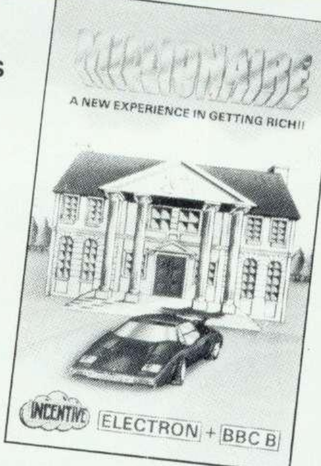
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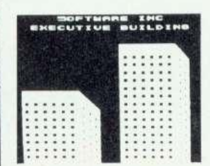
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SPELLCHECK II



NOW IN ROM and up to 500% faster.

SPELLCHECK provides an automatic spelling check for letters or documents and is the ideal companion to WORDWISE or VIEW. It is menu driven, easy to use and allows unknown words to be added to the dictionary, ignored or re-spelt. A new corrected copy of the text may then be saved to disc.

SPELLCHECK I (On Disc)

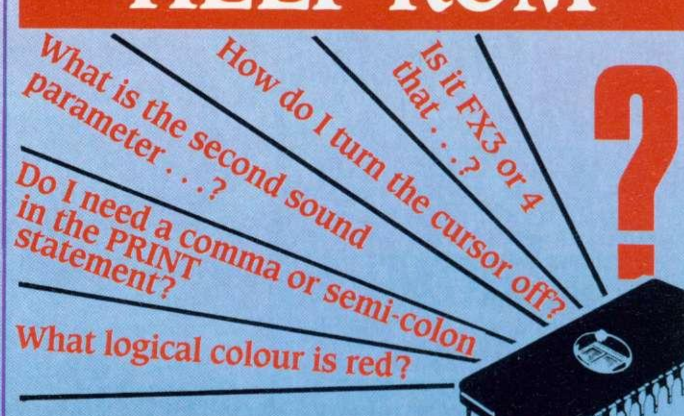
SPELLCHECK I is supplied on two discs with a starting dictionary of 6,000 words. Separate versions are available for WORDWISE and VIEW. (When ordering please specify).

SPELLCHECK II (On Rom)

SPELLCHECK II is a completely new machine code program supplied in Rom. Operation speed is up to 5 times faster than SPELLCHECK I and larger pieces of text may be held in memory. The same version will also check both VIEW and WORDWISE. A dictionary disc is still supplied including 6,000 words, but a data compression technique is used to ensure that well in excess of 17,000 words may be stored on a 100K disc. Ingenious hashing and virtual file access routines have also considerably speeded up the time taken to check text. This sophisticated program is fully 6502 Second Processor compatible and uses the extra memory to further improve word retrieval time.



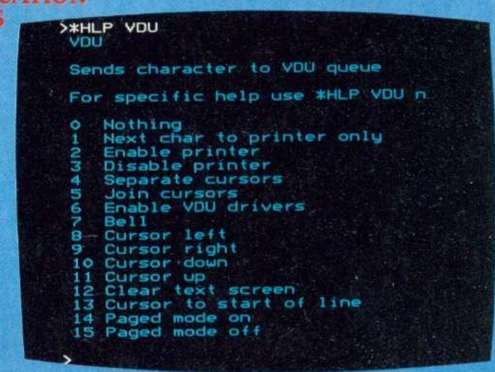
HELP ROM



Give your micro a mainframe utility

Most large mainframe computers have a comprehensive on-screen HELP facility to aid programming, save time and help you out when you get stuck. BEEBUGSOFT's new HELP Rom will give your micro a similar facility.
Just plug it in, and every time you get stuck for a VDU call, a colour code, the parameters for a Basic command or whatever: the HELP Rom will provide an instant answer.
Rather than wade through a book, simply type, for example, *HLP VDU (or just *H VDU) to find out all you need to know about VDU commands – or if you know that it is VDU23 that you want – type *H VDU23.
The HELP Rom uses an ingenious compression technique enabling some 14,000 characters of text to be squashed into an 8K eprom, and provides help on a vast range of subjects, including the following major areas:

BASIC KEYWORDS
MEMORY ALLOCATION
SCREEN MODES
SOUND
COLOUR
TELETEXT
VDU
COMMANDS
FX CALLS



HELP will not affect the normal *HELP command

B.B.C. Micro

SLEUTH

Looking for bugs in your Basic?
Let Sleuth track them down.

Here at long last is the ULTIMATE DEBUGGING TOOL for the Basic programmer!

Dual screen memory workspace

Accelerator speed

Instruction being executed with current statement highlighted

Current procedure name

Values of variables in current statement

Values of other selected variables

Command entry

```
SLEUTH FR GS RP PrFn ACC status
        1  0  1    3  10  HBT
7A                          CP
 1000 FOR X%=0TOnum%: V%=FNval(X%) :IF
%<min% THENmin%=V% ELSE IF V%>max% THEN
ax%=V%

PRC: minimax

VAR: X% =2
     V% =64
     min% =8
     max% =1023

SEL: dV =1.13
     range% =1015

?LOAD "PROG"
?TRACE
?RUN 990
?
```

Control Screen

Program screen

Printer, Breakpoint, Trace, Single step, Status

Dual screen status

Tab toggles between screens

TAB

Space bar single steps

SPACE

SLEUTH allows you to single step through your Basic program instruction by instruction, watching your screen display as it is built up. Simply press the Space Bar to execute the next instruction. Alternatively you may watch SLEUTH's control screen as you step through your program. (Press Tab to toggle between your own screen and the control screen.) This will show you the next instruction to be executed and allow you to list any part of the program. Also displayed will be the contents of all variables associated with the current instruction and the values of other specified variables.
At any time you may alter the values of any variable or update memory. You can even change the line number of the next instruction to be executed or alter the logic within a program statement. Then simply press the Space Bar to watch the next instruction execute.
Breakpoints may also be set up at any position in your program, these allow you to speed to the problem area and then see exactly what's happening. You may even set conditional breakpoints. e.g. Stop IF A%=20.
Advanced trace and decelerator facilities are also included. The decelerator allows you to alter the speed at which your program executes, actually as it is running.
SLEUTH is ideal for the novice and expert alike and will prove to be instantly invaluable, saving hours of debugging time. In addition, the single stepping facility makes it a powerful teaching aid.

Major Features of SLEUTH

- **Single Stepping through Basic** – one statement at a time or a block (e.g. procedure) at a time.
- **Dual Screen Operation** – flip between your program screen and SLEUTH's control screen.
- **Breakpoints** – pause your program at any preset line number, or on the state of any variable.
- **Accelerator** – adjust the speed of your program from full speed to freeze frame.
- **Full Feature Control Screen** – monitor and update vital aspects of your program as it runs.
- **Trace** – a sophisticated line trace facility operating when program runs.

Control Screen Features

- Control screen entered at the press of a key.
- Select edit or single-step mode.
- Adjust program run speed (1-100%).
- View the current program line with the current statement highlighted.
- List the whole or any part of your program.
- Alter the next line number to be executed.
- Read and adjust the value of variables in the current statement.
- Read and adjust the values of any other specified variables or array parameters.
- Insert or remove breakpoints and conditional breakpoints.
- Return to the program screen or continue to single-step or to run at any speed.



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MUROM

The BBC Micro sound facilities have a lot of potential, MUROM will help you exploit this to the full.

Create your own tunes and sound sequences with ease, either with MUROM'S editor and a musical score or by using the Beeb to simulate a piano keyboard.

Edit your creations with the full screen music editor. Then switch to the envelope editor to tailor the tonal quality and select instrument type. Alternatively select one of the predefined instrument envelopes.



Incorporate your music and sound sequences into any program of your own, to play back with or without MUROM plugged in.

Playback is interrupt driven and may continue even while you run other programs.

Predefined instrument envelopes may be set up, e.g. *FLUTE, *SYNTH etc.

Instant sound effects may be called from Basic, e.g. *ZAP, *SIREN, *EXPLODE etc.

MUROM is accompanied by a full instruction manual and repertoire of music data on cassette.

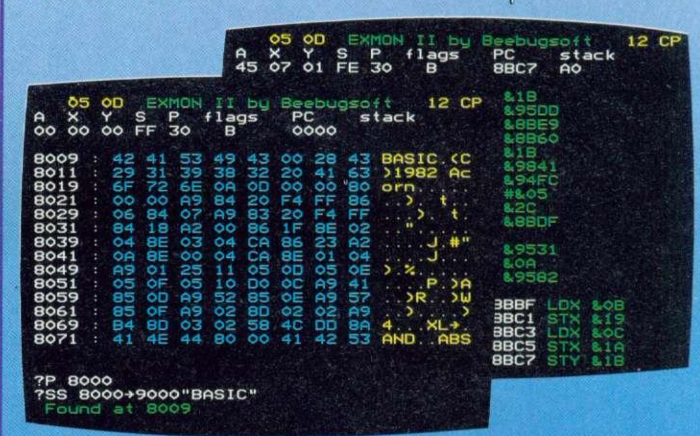
COMMAND SUMMARY

*PLAY	Calls the variable speed, interrupt driven playback routine.
*DISP	Mode 7 display of tune playing.
*TEMPO	Alter tempo.
*KEYB	Use BBC keyboard as a piano keyboard.
*SCORE	Call up full screen music editor.
EDITOR SUB-COMMANDS:	
MODE	Change from editing a single channel to editing all channels consecutively.
GO	Move editor to any note in score.
PLAY	Enable single stepping of music.
OCTV	Change octave of any channel.
ENVL	Change envelope of any channel.
LOAD	Load previously created music.
SAVE	Save edited score to disc or cassette.
KEY	Toggle note entry between note name and keyboard position.
*ENVLP	Sound envelope editor.
*FLUTE,	*SYNTH . . . etc. ten predefined envelopes.
*EXPLODE,	*ZAP . . . etc. ten predefined effects.
*TRANS	Transpose up or down by a number of semitones.
*MONOC	Disable colour output for monochrome screens.

B.B.C. & Electron

EXMON II

EXTENDED MACHINE CODE MONITOR NOW WITH DUAL SCREENS



60 New Commands for debugging and developing machine code

Our very popular machine code monitor has been enhanced by the addition of a number of new facilities, including Dual Screen Operation and full screen memory editor.

Now if you are debugging a game, or any other program with a visual display, you can single step through it instruction by instruction and actually watch the effect on the screen.

You can also revert to the monitor screen at the press of a key to examine registers, edit code, read variables, alter memory etc., and then switch back to your display screen and continue running (or single stepping), without losing your display.

Exmon II features include

- 60 machine code commands.
- Full dual screen operation.
- Full screen memory editor, input in hex, Ascii or as assembler instructions.
- Search for hex, or Ascii string, including wildcards.
- Move memory block.
- Verify that two blocks are the same.
- Relocate code to run at another location.
- Fill memory with series of hex bytes or Ascii string.
- Execute all * commands.
- Single step with skip option.
- Up to 10 breakpoints which may even be set in Rom.
- Conditional breakpoints . . . e.g. Break if register X=5.
- User definable work area.

Note: The Electron version does not feature dual screens.



MUROM **£29.00** EXMON II **£29.00**

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"Must be the most accurate and complete flight simulation for the BBC...the graphics are superb." (Micro User) "This is an exceptional piece of work...you'll probably get more out of it than any other game you buy." (Big K) "A worthy contender for the best program ever for the Beeb."-(GamesComp) STICK OR KEYS. **(Acornsoft) CASSETTE £14.95 DISK £17.65**

FRAK!

"This is a classic...one of the new wave of BBC games that are at last living up to the machine." (Acorn User) "Combines total originality with masterful programming...sets new standards for games on the Beeb...any games player should definitely purchase this masterpiece of programming." (Beebug) NO STICK **(Aardvark) CASSETTE ONLY £8.90**

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SPECIFICATION

1) Random Access—disc based, single or dual drives
2) File Size—99K (40 track), 199K (80 track) —65,000 + records
3) Record Size—up to 2048 characters and 200 fields
4) Field Size—up to 254 characters with complete line scanning
5) Access any record using Primary Key in 2 seconds
6) Holds—1200 NAMES AND ADDRESS records on 100K disk
7) Search—500 records on 5 fields in 60 seconds
8) Sort—500 records on 3 fields in 60 seconds

SYSTEM FEATURES

●CALCULATE—using any valid expression and store results
●POWERFUL PRINTOUT OPTION—Eliminates need for separate mailing program, Parallel/Serial Printout allows setting of printer control codes, line spacing, tabulation, Headings etc, plus label printing with horizontal and vertical tab control.
●REDEFINE—Titles, field widths, number of fields, number of records etc.
●TRANSFER—Records from one file to another.
●SEARCH LISTS—Allow creation of sub-Databases within main Database.

NEW ✱

✱ GLOBALENTRY enables repetitive data to be typed in once and placed in as many records as required. Can also be used with a search list to provide a powerful global edit/update facility that will save hours of typing.
✱ SPOOLER enables you to create spooled files that are compatible with Wordwise, View and other word processors. You can therefore present your data within a document or in varying formats etc.
The spooler program will allow to format your spooled file in the same way as the print out option. You can therefore have headings, columns, titles, numbers etc.
✱ INPUT is a routine included on the disc which will allow you to write utilities for accessing your data and tailored specifically to your needs.
✱ TUBE compatible with the 6502 second processor.
✱ Comprehensive manual and tutorial.
All timings and sizes are relative to ACORN DFS. Compatible with ACORN DFS, WATFORD 1.3 and latest AMCOM DFS SERIES B.
✱ ORIGINAL USERS send your disc plus £3 for up grade.

REPLICA II: £12.00. DISC

The original REPLICA set a very high standard so the specification we set our chief programmer included some impossible features. In fact ACORN state that some of the things that we have done are impossible, it just took us longer that's all. REPLICA II transfers most cassette based programs to disk, even more than REPLICA. When you buy disk drives you do not have to throw away expensive cassette based programs.

REPLICA II transfers 'LOCKED' programs, programs loading as files, programs that load below &EOO, those with up to 6 sections and those up to &6E in length eg adventure programs. No waiting for 6 minutes whilst adventure programs load.

REPLICA II is very easy to use. The user enters a name, how many sections and whether CHAIN,*RUN or *LOAD to load the first section. Press play and let the program do the rest, even a menu.
Think how much it will cost you to buy just 1 disk version of your favourite program—REPLICA II which will hold up to 16 programs, limited only by the disk capacity.

FX 80 PRINTER DRIVER £12.00

PRINTER DRIVER FOR EPSON FX80 AND VIEW
Multi-page driver with print menu allowing the setting of global (document wide) printer functions at printer initialisation.
The print menu program contains a sophisticated character generator which allows the construction of 95 user defined characters which are then accessible from VIEW via a highlight option.
Supplied on disc with comprehensive user manual.

NEW DISCDEX: £15.00 DISC

●Catalogues all your discs quickly and easily.
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●Compatible with single or dual drives.
●Extensive print options for catalogue and disc labels.
●Update and delete options.
●Supplied with stick on labels to number your discs and a supply of labels for printing your own disc labels.

DISCDEX is the answer to a disc users nightmare. How many times have you had to wade through your discs looking for the file that you know is there somewhere? Now with DISCDEX those days are gone.
DISCDEX will catalogue all your discs and store them in alphabetic order. In addition to the very useful search and load facility DISCDEX will also print out a full catalogue in alphabetic or disc order. Even more useful is the ability to print disc labels for sticking on the disc or the jacket.
DISCDEX is only suitable for discs with 31 file names as in the standard ACORN system. It is not suitable for double density interfaces.

NEW ONESHOT: £12.00 DISC

●Full feature trace utility.
●Single step through BASIC program or halt at user determined interval.
●Print line number prior to execution.
●Obey fixed instructions before executing a line.
●Trace window allows screen to be seen whilst tracing execution.
●"Printer only" will force trace output to a printer allowing full screen display.
●Ability to dynamically alter control of ONESHOT.
●ONESHOT can be configured to run in any area of memory.

ONESHOT is a 1.25kb machine code program which gives the user several powerful aids in debugging BASIC programs. These include the ability to SINGLE STEP through the BASIC code of the target program, stopping the processing at specified points and comprehensive trace functions of the variables used by the target program.
A very powerful option allows the user to enter a command string into function key 0 and instruct ONESHOT to obey this command BEFORE each line is executed e.g. *KEY0 PRINT X%¦ M will print the value of X% before executing each line. This is a very simple example and it is possible to do much more complex things including printing the value of a variable only when it changes or when it reaches a certain value or falls within a certain range. This option can also be used to dynamically alter ONESHOT as it is working. The power of this option is only limited by the users ingenuity.
In addition to ONESHOT the disc also contains 3 very useful function key routines. The first will search for any DEFPROC or DEFFN and print the line numbers in which they appear together with the name of the procedure or function. The second will search for a specific procedure or function and print the line numbers containing it. The third routine will print out every active variable together with its present value.
ONESHOT is not compatible with double density interfaces.

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FUN HOUSE is a highly original suite of educational programs suitable for ages 3 to 13. The program is designed to encourage children to spell words which relate to objects found around the home. Animation and music are used to good effect and some highly original ideas are incorporated.
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A database in its simplest form consists of a set of records in the same general format that can be manipulated, sorted and printed in various formats using a database management program. For convenience each record is divided into the same number of fields and keywords. A field is the basic element of the record. It is either printed or not, and can be used to sort the records. A keyword usually consists of supplementary information, often not required for printing, but useful for defining subsets of the data. For example, each of my address records has the general format:

Field 1:	Title, initials
Field 2:	Surname
Fields 3, 4, 5:	Address
Field 6:	Telephone Number
Keywords:	Relation?
	Send Christmas card?

so that one might look like:

Mr. J.C.
Smith,
49, Acacia Avenue,
Bloxton on Sea,
Norfolk.
20826
UR,XC

Here I'm using UR to represent unrelated, and XC to remind me to send a Christmas card. Note that the surname is given its own field as it would be impossible to sort by surname otherwise.

A large database management program doesn't leave much space for data (especially when using a disc filing system). Consequently you must consider the type and number of records you wish to save when designing (or buying) a system.

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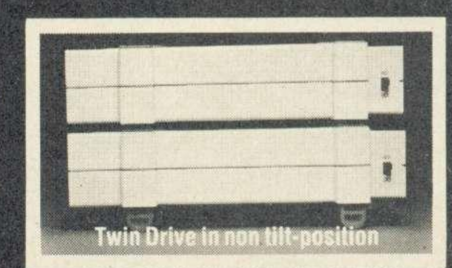
Disc based: The management program is always in memory, but with

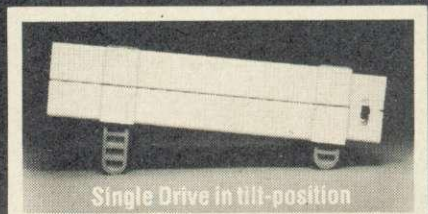
See yellow pages 109-112 for Mike Fryer's database management program

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only a small subset of the data. This allows for very large data sets, but there are a terrific number of disc reads/writes, which lead to relatively slow sorting, for example.

The program described here (listed on yellow pages 109–112) is one which will work as a cassette system, or can be 'overlayed' for a disc system, so that although all the data are always in memory, only the 'active' part of the program is resident. This releases further memory for data.

This type of management program is suitable for those who are using a cassette system but are considering upgrading to discs. It also has the advantage that with overlays extra subroutines can be added without reducing the upper size of the data set.

I will describe the cassette-based program, but instructions for overlaying the subroutines for the disc system are given at the end. The program is menu driven (figure 1), and the items on the menu are as follows:

Option 1 If you want to zero the file in memory or start a new file choose this. You will be required to state the number of fields and the maximum number of characters in each, together with the number of keywords. The total number of characters in each record cannot exceed 255. The listing allows for up to 200 records of six fields but you can change these values by suitably modifying line 100.

Option 2 Choose this to read in an existing data file from tape (or disc). This data will be added to the end of any data file already in memory. If the data in memory and on the tape file are not completely compatible (in that they have the same number of fields, etc), then the process will be aborted and you will be returned to the menu.

Option 3 Use this to type in further records to add to any already in memory. Each of the fields is checked for length, as is the total number of characters in the keywords. Note that you will be asked to re-input any invalid field. It is quite acceptable to input blank fields or fewer keywords than requested, but if more keywords are input the excess is disregarded in later operations.

Option 4 This allows you to delete records – either by the number of the record or by a keyword. If you choose 'Number', then give the numbers of the first and last records to be deleted in the form FIRST,LAST. To delete a single record NN, just type NN,NN. If you choose 'Keyword' you are given the choice of whether to eliminate all records *with* that keyword or all records *without* it. For example, to produce a list of people I send Christmas cards to, I would choose this option to eliminate all records without the keyword XC.

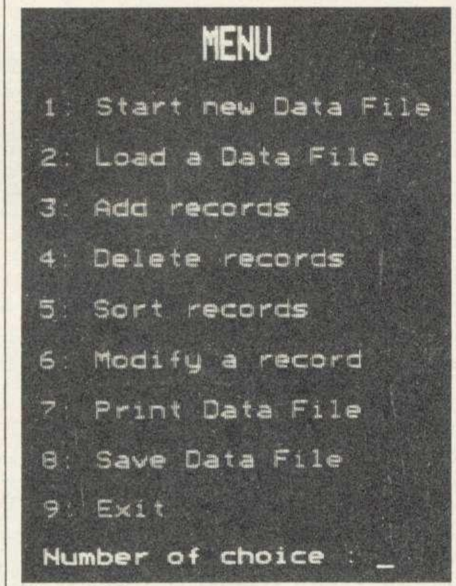
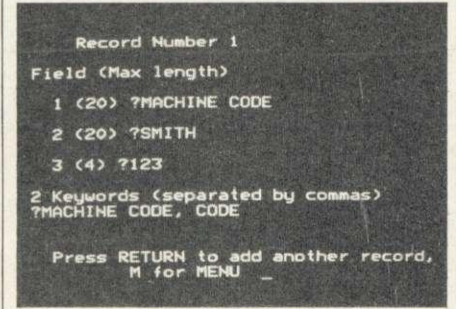


Figure 1. The menu



Constructing a record

Range of records to be output
first,last (0,0 for all records): 1,3

How many records across screen (<5) ?2
How many lines between records ?2
RECORD NUMBER 1
Position of Left Margin :5
RECORD NUMBER 2
Position of Left Margin :35
Print Field 1 (Y/N) ? Y
Number of leading spaces :100
Print Field 2 (Y/N) ? Y
Number of leading spaces :1
Print Field 3 (Y/N) ? Y
Number of leading spaces :0
Print Field 4 (Y/N) ? Y
Number of leading spaces :0
Print Field 5 (Y/N) ? Y
Number of leading spaces :0
Print Field 6 (Y/N) ? Y
Number of leading spaces :0
Print Keywords (Y/N) ? Y
Number of leading spaces :0
Press 'P' to print, 'L' to list P

Figure 2. The commands for printing the first three addresses in blocks of two across the page

Option 5 Choose this to sort the records into alphabetical order by any field. You are asked the field number, and the sort takes place, which can take quite a few seconds if there are several hundreds of records.

Option 6 It's useful to be able to modify one of the fields of a particular record – to correct an address or change a keyword. Use this option in conjunction with the COPY key.

Option 7 The *raison d'être* of this program. Output of all or part of the data set can be sent either to the printer or the screen. You can choose how many records are printed across the page (check your paper width!) and the vertical separation between the records. Next you are requested to give the tab position for each record across the screen (eg, these might be 5, 25 and 45 if three are required). You are now asked for each field in turn, and whether it is to be output or not. If the answer is 'yes' you have to supply the 'number of leading spaces' – the number of spaces beyond the tab set above. If 100 is added to this number then the next field to be output is printed on the same line. So for an address the number of leading spaces for the first field might be 100 and for the second, 1. This would mean that the title, initials and surname would be printed on the same line with one space between the fields. To check that you've set up the print parameter correctly it's worthwhile just printing the first few records. Figure 2 shows the commands to print the first three addresses, two across the page. The output is shown in figure 3. Figures 4 and 5 show how to convert the address list into one of telephone numbers. To avoid too much typing, you are given the chance of repeating the same output format the next time you choose this option.

Option 8 The main parameters together with the data are saved on the currently open unit (either cassette or disc).

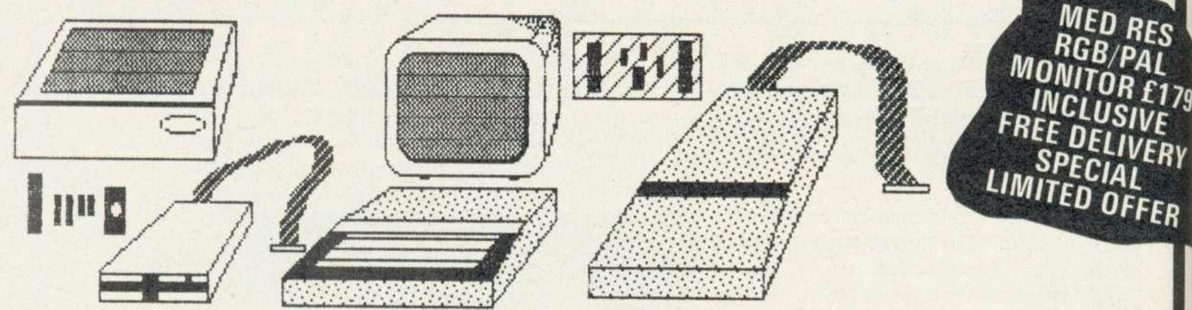
Option 9 Choose this to leave the system.

Much of the data will be checked on input. However, to avoid the program being too long, any other errors (including the 'panic button' Escape) redirect the program to the menu after reporting the error. For example, if any character outside the range 1 to 9 is used with the menu, an 'ON range' error is reported before returning to the menu.

Overlays are for disc use only. The program is split up into its constituent parts and arranged so that at any time only the 'active' procedures are in

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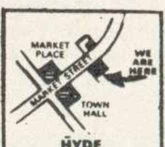
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DBASE2	780–1040	PROCold	2BE
DBASE3	1050–1280	PROCadd	214
DBASE4	1290–1990	PROCdel,PROCdnum,PROCdkey, PROCsplit,PROComit	4B1
DBASE5	2000–2190	PROCsort	1AB
DBASE6	2200–2400	PROCmod	188
DBASE7	2410–3230	PROCprnt,PROCoutput,PROCblank, PROCjoin	6F8
DBASE8	3240–3410	PROCsave	114

Table 1. The nine sections of the program

```
Mrs. A. Diggle,            Mrs. A. Fryer,
The Firs,                  19, Cumberland Drive,
Claxton,                   Holton,
Somerset.                  Devon.
501597                     331789
UR                         R,XC

Mr. J. C. Smith,
49, Acacia Avenue,
Bloxton on Sea,
Norfolk.
20826
UR,XC
```

Figure 3. The output generated by the commands in figure 2

memory, thus saving space and enabling us to work with larger databases. I've split the program into nine sections (table 1). DBASE0 is the main program, always resident, whereas DBASE1 to DBASE8 are moved in and out of memory as and when required. In order to use overlays, sufficient memory has to be saved above the main program for the largest of these overlays to be loaded, ie, we increase LOMEM by a suitable amount, preventing this region being used for data. Next, the computer has to be fooled into thinking the overlay is part of the main program, by removing the 'end of program' marker, which resides in the last two bytes below TOP. Finally, we call the correct overlay when required. To do this I've written a short subroutine to be added to DBASE0, which sends the correct *LOAD request via a call to OSCLI at &FFF7 when a new overlay is required.

```
Range of records to be output
first,last (0,0 for all records): 0,0

Repeat Format (Y/N) ? N
How many records across screen (<5) ?
How many lines between records ?1
RECORD NUMBER 1
Position of Left Margin :1
Print Field 1 (Y/N) ? Y
Number of leading spaces :100
Print Field 2 (Y/N) ? Y
Number of leading spaces :101
Print Field 3 (Y/N) ? N
Print Field 4 (Y/N) ? Y
Number of leading spaces :104
Print Field 5 (Y/N) ? N
Print Field 6 (Y/N) ? Y
Number of leading spaces :2
Print Keywords (Y/N) ? N
Press 'P' to print, 'L' to list P
```

Figure 4. The commands to convert the list of addresses into one of telephone numbers

```
Mrs. A. Diggle,Claxton, 501597
Mrs. A. Fryer,  Holton, 331789
Mr. J. C. Smith,Bloxton on Sea, 20826
```

Figure 5. The list of telephone numbers output by the commands given in figure 4

Here are the additions and amendments we must make:

Add

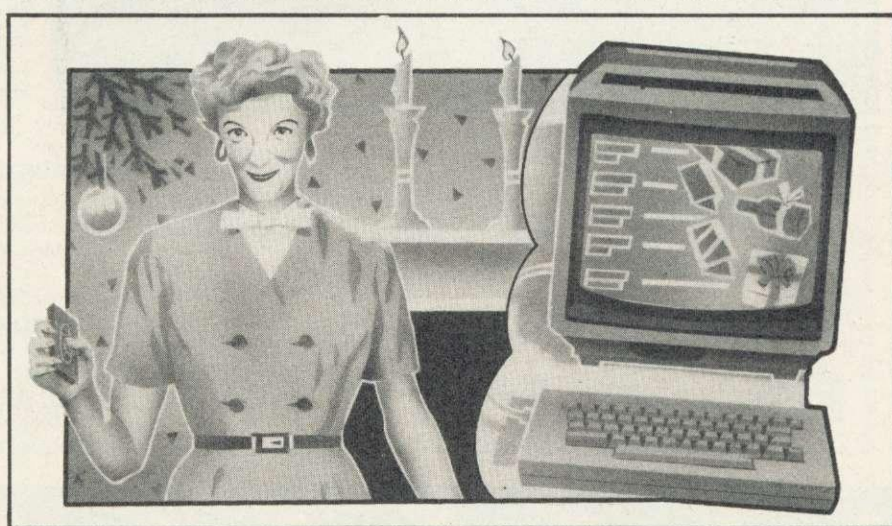
```
72 REM reserves space for overlays
74 LOMEM=TOP+&700
76 REM removes 'end of program' marker
78 t%=TOP-2
79 oflg$="0"
551 DEF PROCoverlay(n$)
553 IF n$<>oflg$ oflg$=n$ ELSE ENDPROC
555 $&C00="LOAD DBASE"+n$+" "+STR$~(t%)
557 X%=0:Y%=&C:CALL &FFF7
559 ENDPROC
```

Note that in line 74 &700 is larger than the longest overlay (table 1).

Replace

```
330 PROCoverlay("1"):PROCnew:pb%=0:ENDPROC
340 PROCoverlay("2"):PROCold:ENDPROC
350 PROCoverlay("3"):PROCadd:ENDPROC
360 PROCoverlay("4"):PROCdel:ENDPROC
370 PROCoverlay("5"):PROCsort:ENDPROC
380 PROCoverlay("6"):PROCmod:ENDPROC
390 PROCoverlay("7"):PROCprnt:ENDPROC
400 PROCoverlay("8"):PROCsave:ENDPROC
```

With this overlay technique, it's easy to write your own procedures and incorporate them via the menu and a call to the procedure using the ON GOTO statement in line 320. For example, you might find it useful to be able to interchange fields, to add fields to existing records or even to allow for mathematical manipulations of numeric fields (eg, to automatically update a person's age by subtracting his birthdate from the present date) – the list is endless.



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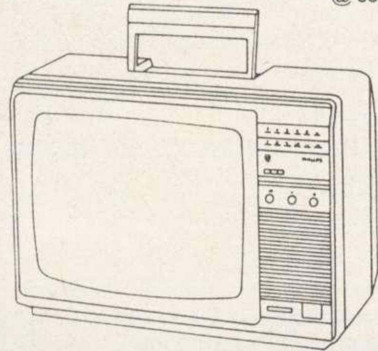
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SORTING FOR SUITABILITY



The ROM based Gemini Datagem package

Vincent Fojut files his verdict on six software packages to help you find the right one for your needs

DATABASES, like word processors and spreadsheets, form one of the classic application areas for micros. A number of competing packages are now available for the BBC micro, with a wide range of features and prices. What a database is and how it can be used are defined in Mike Fryer's article (see page 143), but if you already have an application in mind, how do you choose the best database for your requirements?

Any database package should be able to execute a certain number of basic file-accessing functions with relative ease. These include the addition, deletion and updating of records in a file, and the retrieval of records depending on particular criteria. For example, the business user does not want to search each individual entry of an enormous order file for, say, any order worth over £100. This is the sort of search that any self-respecting database should do automatically.

Other common functions include the ability to sort, or re-sort, a file depending on the values of one or more fields in a record. Normally, sorting on just one field copes with most common requirements, eg, a micro-based address book is most useful if kept within alphabetical order of surname. Sometimes, however, it is helpful to sort on more than one field, or 'key'. An employer may have several Smiths on his payroll and may wish to use a secondary key of 'forename' to cope with such circumstances. If there are several John Smiths in the organisation, then further sort keys may be necessary.

Finally, there is little point in accessing data if it cannot be presented in a meaningful fashion, so some degree of printout formatting is usually standard in databases. It is often possible to control the positioning of fields on printout, change the order of fields, and select only specific fields within a record. This latter option is probably the most useful. Imagine using your address-book file to prepare a series of address labels – if your record layout had a telephone number field, you would not want it printed on the address label.

Potential applications for databases are legion. In the home, you can file record and book collections, a list of computer programs, names and addresses, recipes, and so on. The amateur club or association could create a membership file, a great time-saver for printing address labels whenever members' subscriptions are due! In business, the right database package could be ideal for keeping track of customers, suppliers, orders, invoices and so forth.

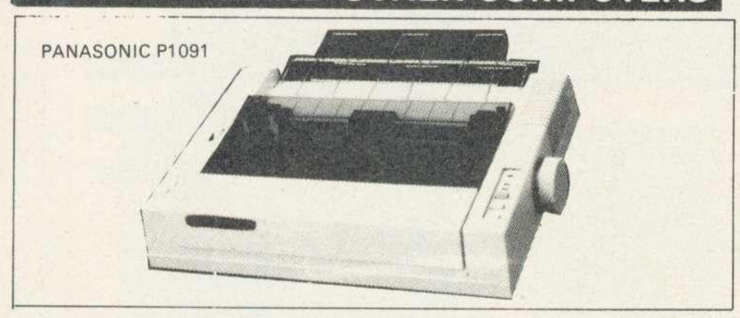
Lastly, an educational environment could also use a database to good advantage. Apart from its obvious place in computer studies, as an example of a typical computer application, the database has a role to play in any discipline involving the collection and analysis of large amounts of data, for statistical or other purposes.

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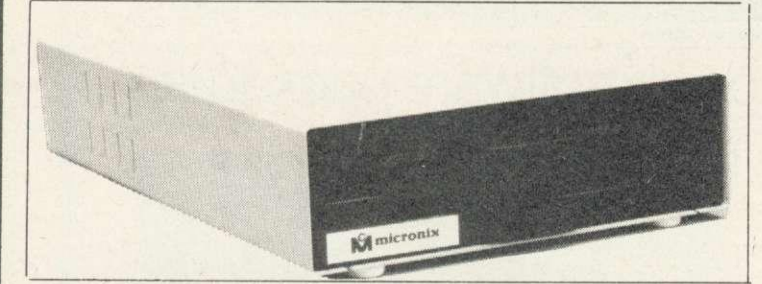
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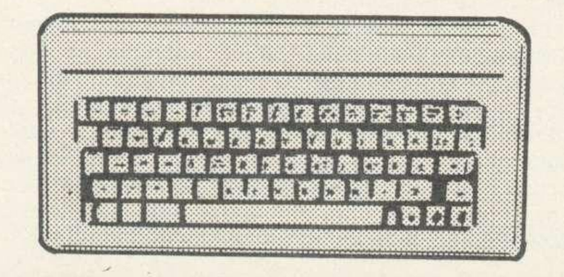


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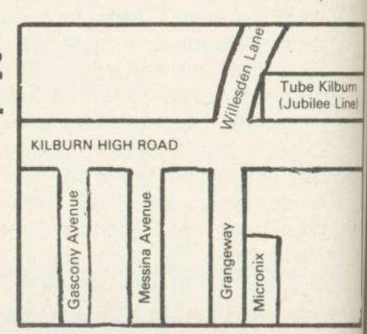


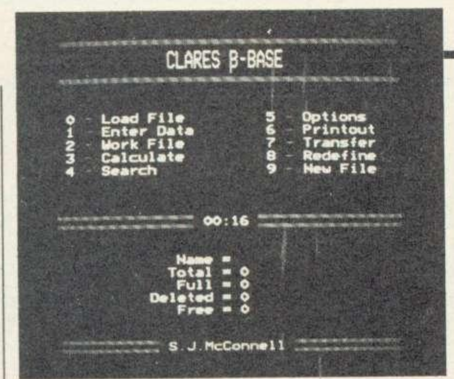


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Beta-Base – rated best value for money

Cassette, disc or ROM?

Databases for the BBC micro come on cassette, disc or ROM. Cassette systems are usually the cheapest, and use the micro's free memory to store records. Accessing records is extremely fast, but a file can consist of only a small number of them. Also, because of the serial nature of cassette files, updating just one record involves loading the whole file into memory, altering the record, then saving the entire file onto (another) tape.

With disc-based products, record retrieval is normally slower if there are a large number of records on the disc. The bonus is that file size is generally limited not by free RAM but by the size of the disc (see Mike Fryer's article for an interesting twist to memory usage – a cassette-based program, which, if modified for disc, uses program 'overlays' to ensure maximum memory is available for record storage).

ROM systems, though usually the most expensive, offer further advantages. The program is instantly accessible and does not encroach on free memory. Files are still stored on disc, though the extra RAM available can minimise the number of disc accesses required, say, to browse through a file.

Choosing a database

You may still be wondering which features you ought to be looking for in a database. The first step in choosing the best one for your requirements is to assess carefully the application in mind. It's a good idea to write out record layouts for the file(s) you intend to use, with a list of fields and their maximum sizes. Consider how many entries (ie, records) you are likely to need per file. Allow for expansion, and ask yourself how big your files will need to be in a few months' time – not just now. Bear the following simple rules in mind when calculating sizes:

File size = no. of recs. * rec. size
Record size = sum of lengths of individual fields within a record

If anything, overestimate – make the records and files slightly larger than you think you need. You are almost certain to want to add something at the last minute! Give particular thought to the kind of searching, sorting and printing of data that you are likely to need (tables 2–4). These are the areas where databases seem to differ the most, in terms of options and implementation. If possible, have a good read of the documentation of any database package you are contemplating buying and, if you get the chance, try out those features of importance to you.

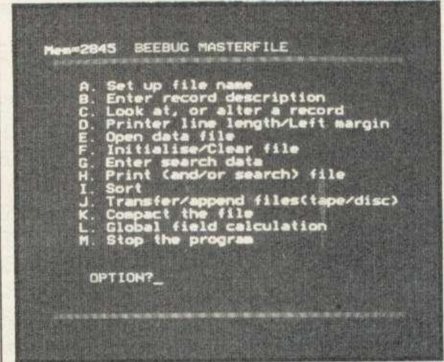
The accompanying tables provide both quantitative and qualitative data on six databases currently available for the Beeb. What follows is not intended as an exhaustive comparative review but outlines the typical features you are likely to come across, with an indication of how they compare.

To provide ourselves with a yardstick, any reference to a 'typical' record should be taken to mean the following general layout (from an imaginary 'address book' file):

Forename (20 chars)
Surname (20 chars)
Address1 (25 chars)
Address2 (25 chars)
Town (25 chars)
Postcode (10 chars)
Phone no (15 chars)

Some of the points covered within the tables merit further explanation. Table 1 covers file, record and field sizes. Where possible, maximum values are given. All systems reviewed here allow only one file to be open at a time, though there's obviously no limit to the number of files that can be maintained. Some rather advanced micro-based systems allow more than one file to be open simultaneously, so that data in physically distinct files can be transferred or compared.

It should be clear that file, record and field sizes are all inter-related: an in-



Masterfile was thorough but slow

crease or decrease in one leads to appropriate changes in the others. The 'Fld calcs?' heading denotes whether calculations can be carried out on values stored within fields.

	Masterfile	Beta-Base	Datafile	Multibase	Profile	Datagem
System type	disc	disc	disc	cassette	cassette	ROM/disc
No. files open	1	1	1	1	1	1
File length	= disc size	= disc size	approx. 700k	approx. 4.5k	approx. 13k	10 Mb
Recs per file	= disc size/ record length	500 max in search/sort	700 on 100k disc	1469 (3 byte recs)	approx. 13k (1 byte recs)	5,110
Rec length	425 bytes	2k bytes	approx. 480 bytes	1,800 (1 rec file)	approx. 13k (1 rec file)	6143
Fields per rec	17	200	av 12	9	limited only by memory	62
Field types	String Real No. Integer	String Real No. Integer	String	String	String Real No. Integer (16 & 32 bit). Block String Char.	String 'Numeric' Text Date
Fld lgth (string)	25	254	av 40	200	132	120
Fld calcs?	Y	Y	N	N	N	Y

Table 1. File, record and field data (av = average, all other values are maxima)

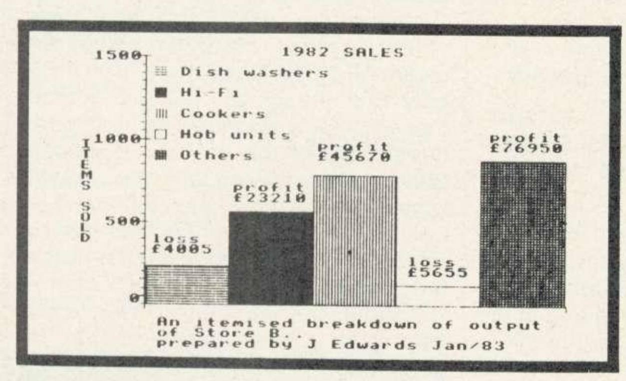
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Auto & Manual Scaling	YES	YES
Grid & Scatter Options	YES	YES
No of simultaneous graphs	5	3
Overwrite memory	YES	NO
Screensave facility	YES	YES
Screendump facility	YES	YES
Fixed description per graph (char's)	up to 200	100
Full plot and axis editing	YES	YES
Save, Load & *CAT facilities	YES	YES
Single file selection	YES	NO
Operating Manual (pages)	52	52

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Max no' of Holdings	20	20
Transactions per holding	16	16
Range adjuster	YES	NO
File Manager	YES	NO
Printer Manager	YES	NO
REPORTS PRODUCED:-		
Portfolio Valuation	YES	YES
Portfolio Profit Analysis	YES	YES
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Magnification option	YES	YES
Grid	YES	YES
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Screendump	YES	YES
SELECTABLE GRAPHICAL INDICATORS:-		
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Centred Moving Average	YES	YES
Rise and fall indicator	YES	YES
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Table 2 covers searching abilities. 'No. relational operators' shows how many different comparisons of the 'greater/lesser than' and 'equal to' type of search test which can be performed. Most systems allow all six relational operators (=, < >, <, >, < =, > =) to be used. The use of AND and OR connectives, as in Basic, allows more complex tests to be carried out in one step: eg, searching for Surname = 'Smith' OR = 'Jones' would find all entries in your address book with *either* surname.

Wild cards should be familiar to DFS users. These are special characters that can be used to represent any single character, or group of characters, in a search string. Thus 'FIND B T' might come up with BIT and BAT, and 'FIND IN*' might uncover INK and INSTRUMENT.

The INSTR function (called a 'fuzzy search' in *Masterfile*) acts as in Basic – ie, you can search for the occurrence of a substring anywhere within a larger string.

Datafile: the program menu

Some databases have only a case-dependent search facility, which means that a match is found only if you enter your search value exactly as the original field was entered in terms of use of capital and lower-case letters. If you wanted to search for all 'Smith' records, irrespective of whether they were entered in upper-case, lower-case, or a mixture of both, you couldn't do this on a case-dependent system.

Sorting, ie, arranging files in a specific order, is outlined in table 3. Remember that sort field length is not always the same as the length of the field being sorted! For instance, some systems may allow a very long string to be used as a sort key, but only perform the sort operation using the first few characters of the string. If you are intending to sort long fields, be wary of this, as the sorting performed may not be satisfactory. Sorting is nearly always case-dependent – all upper-case entries being 'less' in value than lower-case.

Table 4 covers a number of printout options: range of formatting available,

	Masterfile	BetaBase	Datafile	Multibase	Profile	Datagem
No. search flds	17	5	= no. of flds on record	1	= no. of flds on record	6?
No. relational operators	6	6	6	3	1	6
'AND' & 'OR'? (on same fld)	Y	N	N	N	N	Y
Wild cards?	N	N	N	N	Y	Y
'INSTR'?	Y	Y	Y	Y	N	Y
Case dependent?	N	Y	N	Y	N	either

Table 2. Search facilities (all are maximum values)

	Masterfile	BetaBase	Datafile	Multibase	Profile	Datagem
No. sort flds	16	3	av 12	none	30	1
Sort fld lgth	25	10	av 40	N/A	132	120
Ascending?	Y	Y	Y	N	Y	Y
Descending?	Y	Y	N	N	N	Y
Case dependent?	Y	Y	N	N/A	Y	Y

Table 3. Sorting facilities (av = average, all other values are maxima)

	Masterfile	BetaBase	Datafile	Multibase	Profile	Datagem
Select flds?	Y	Y	Y	N	singly	Y
Change order?	Y	Y	N	N	N	Y
Position flds?	Y	Y	Y	N	N	Y
Single labels?	Y	Y	Y	Y	N	Y
Double labels?	N	Y	Y	N	N	N
Spool output?	Y	N	Y	N	N	Y

Table 4. Printout facilities

	Masterfile	BetaBase	Datafile	Multibase	Profile	Datagem
Cost (inc VAT)	£19.00	£25.00	£49.50	£9.00?	£19.99	£129.95
Searching	8	6	8	3	5	8
Sorting	6	6	7	0	7	7
Printout	7	8	8	4	4	9
Speed	5	7	7	5	6	7
Modification of file structures	6	6	6	1	0	8
Documentation	7	7	7	5	5	9
Ease of use	7	8	6	6	4	7
Overall value	7	8	5	5	4	7
Comments	Thorough but slow, otherwise v. good	Very good all-round. Best value for money	Versatile printing. Costly, for disc	Cheap, very limited	Good for cassette but over-priced	Excellent if you can afford it

Table 5. Overall performance (marks out of 10)

whether single and/or double address labels can be printed, and whether printed output can be sent to a 'spool file' – vital for transferring database output to other systems, such as word-processors. A spool file is simply the data saved to disc or tape as an ASCII file rather than as data.

Finally, table 5 summarises the major features with marks for overall performance. Additional points of interest not covered in the tables are outlined below.

Six products compared

Masterfile, from Beebugsoft, is the first of three disc-based systems reviewed. It has clearly defined limits to field, record and file sizes, and these could prove restrictive for 'serious' uses, although most home requirements should be satisfied. A nice touch is that total, average and standard deviation values are produced for any numeric fields in a retrieved subset – ideal for statistical work. The search facility is

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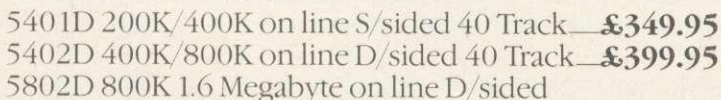
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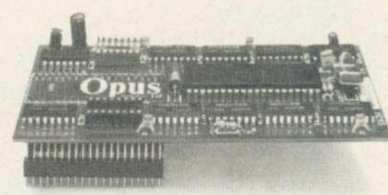
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thorough, in fact, probably the most extensive of all the packages tested here. Any (or all) fields in a record can have a search condition set against them, allowing powerful searches to be carried out in one step.

Sorting is also versatile with *Masterfile*, allowing up to 16 sort keys to be used at a time – more than enough for any requirement I can think of. Furthermore *each* sort key can be selected for ascending or descending sort order, unique among the systems reviewed here. The great bugbear is the sorting speed, which the manual admits is very slow. The documentation also points out that it's best, where possible, to sort on only one key, since a faster sort routine is automatically selected when this is the case.

Masterfile is supplied with a sample datafile on disc and a small but clear and adequate manual.

On a similar level in terms of price and performance is *Beta-Base*, from Clares Micro Supplies. Searches are limited to a single field, although they can be restricted to a given range within the complete file by specifying start and end addresses. Once a search has been carried out, the



Good but overpriced was the verdict on Profile

records that satisfy the search conditions constitute a 'search list'. Sorting and printing operations can be carried out on this search list rather than on the entire original file. Search lists can be saved and reloaded as separate files, but to reload them the original file must be in memory.

The maximum number of records in a search list (and therefore for sorting) is 500, although the number of records on file could be higher. Sort fields are restricted to a maximum of three, and only the first 10 characters of any field are considered during sorting, even though fields can be up to 254 bytes long. Unfortunately, I seemed unable to invoke MOS commands (*...) from within *Beta-Base*, for example, to create spool files for input to other systems. If this *is* possible, the manual doesn't make it clear.

The third of our disc-based systems is *Datafile*, from Cardiff Micro Software. Among its features is its use of indexed fields, allowing rapid retrieval of individual records (typically five seconds). The more usual sequential searching is also available. Any kind of field can be defined as indexed, and any number of indexed fields can occur within a record. However, they must all be positioned at the start of the record layout.

Since the order of fields cannot be changed on printout, it may be necessary to duplicate indexed fields within the body of the record, which obviously uses up file space. In other respects, the print formatting options are very versatile. Any field can be selected for printout, and its starting column position can be specified. Embedded spaces and line-feeds are also easy to add.

Another neat facility is that sorting (on multiple keys if desired) can be specified at the same time as a search. That is, if records are found matching the required conditions they are automatically sorted in the appropriate order. Only ascending sorts are possible. Validation of user input on the 'Print layout' menu leaves a lot to be desired – nonsensical values are not trapped.

Should the structure of the datafile need to be modified in any way (eg, extra or larger fields) a 'Restructuring' program allows this. However, the manual warns that this is a slow and tedious process and, looking at the instructions, it does appear extremely complicated.

Multibase is a cassette-based package from G.Soft Micro Software. RAM is used for file storage, allowing at one extreme a file holding a single record of 1800 bytes or at the other 1469 records of three bytes each. This suggests a maximum of about 4.5k for file storage, which seems very small. Using our 'typical' address record, you can expect to store about 30 records per file.

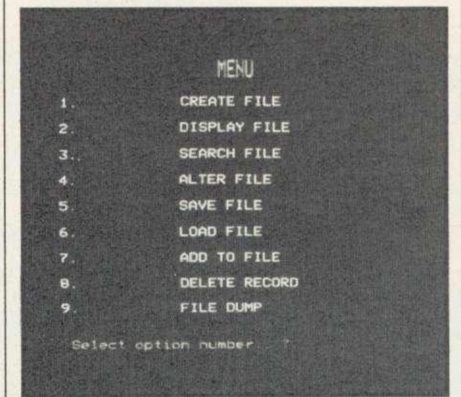
You can't compare an inexpensive cassette system directly with a more costly disc package, but all the same, the facilities provided are very rudimentary – non-existent as far as file re-sorting is concerned. Searching is limited to one field, and only three relational operators are permissible – 'equal to', 'less than/greater than' the search value.

Printing is restricted to the entire file or entire records. You could use the system for printing labels, but you cannot leave out undesired fields during printing.

Profile, a cassette-based package from Haiku Software Technology, is unique in its use of variable-length records. This makes efficient use of RAM by eliminating the unused space often found in predetermined, fixed-format record layouts. Fields can be one of six types, further improving memory usage:

1. unsigned integer (16-bit nos.)
2. signed long integer (32-bit nos.)
3. numeric reals
4. character (1-byte string)
5. string
6. block string (a field built of several strings)

A record can have up to 30 key fields, which together allow it to be uniquely defined and also provide very rapid retrieval of individual records. *Profile* automatically sorts records on entry, but it can re-sort files at any time, using the specified key fields. If a record search is requested on a non-key field,



Multibase – limited facilities but cheap

or if you want to search for more than one record, the system automatically performs a sequential search through the file. This is very tedious to set up. Every single field within the record is presented in turn for possible inclusion in the search criteria.

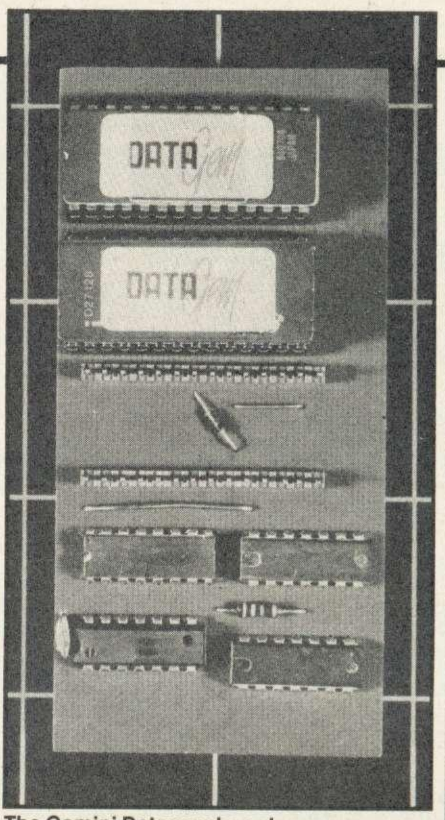
The 'wild card' facility is not flexible enough to allow a full INSTR simulation. You can check whether a substring occurs at the start of a string or after a fixed number of characters, but not *anywhere* within a string, as allowed by INSTR. Printout facilities are a weak point, with virtually no control over formatting.

There is, incidentally, no reason why cassette-based systems need have limited printing capabilities. Mike Fryer's article demonstrates some of the facilities that can be implemented.

Datagem is a ROM-based offering from Gemini, supplied in 24k of EPROM on a special carrier board. It requires a BBC system with at least one disc drive, to load and store data files. As one might expect from the price, the product has a very professional feel to it.

The package is undoubtedly powerful, but the range of options available, the sizeable manual, and the number of special control-keys to be learned combine to make the system appear unduly complex at first. Perhaps its greatest strength is the large size of files that can be accommodated (potentially spanning more than one disc). The number of search fields is limited at any one time by the size of the input line to about six, but lists of records can be stored in one of eight levels and combined with one another to produce increasingly complex subsets of the original file.

Comprehensive calculation facilities are available, and equations can be conveniently stored under single-letter mnemonics. Screen formatting is attractive, but time-consuming to set up. A separate 'Print layout' record allows two different record formats to co-exist, one suited to screen, the other for printout. A 'default' record can be set up to simplify adding new records. Any fields not entered at creation time are set to the values specified on the default record.



The Gemini Datagem board

Conclusion

The suitability of the products reviewed here could be summarised as follows:

If you want fast retrieval from a limited number of records, are unlikely to perform frequent updates and don't need any fancy sorting or printing features, then either cassette system would suit you. However, *Profile* does not compare well to similar-priced disc systems with much better facilities.

Any of the disc systems would suit most typical home, school or even modest business requirements. *Masterfile* offers complex searches in one step, comprehensive sorting but slow sort speed. *Beta-Base* is a good all-round performer and is easy to use, but has a sort field length of only 10. *Datafile* has fast indexing, versatile print formatting, but seems over-priced at twice the cost of the other systems.

Datagem stands out in terms of both price and performance, though whether it is worth the money is a moot point. If you have serious business applications in mind, especially using large files, and cost is not an obstacle, then *Datagem* is probably the most sensible buy. As with any sophisticated system, its power is largely determined by the user's willingness and ability to get to grips with the facilities.

If you would like further insight into the workings of databases, or want a system for hands-on experience, Mike Fryer's article will prove helpful.

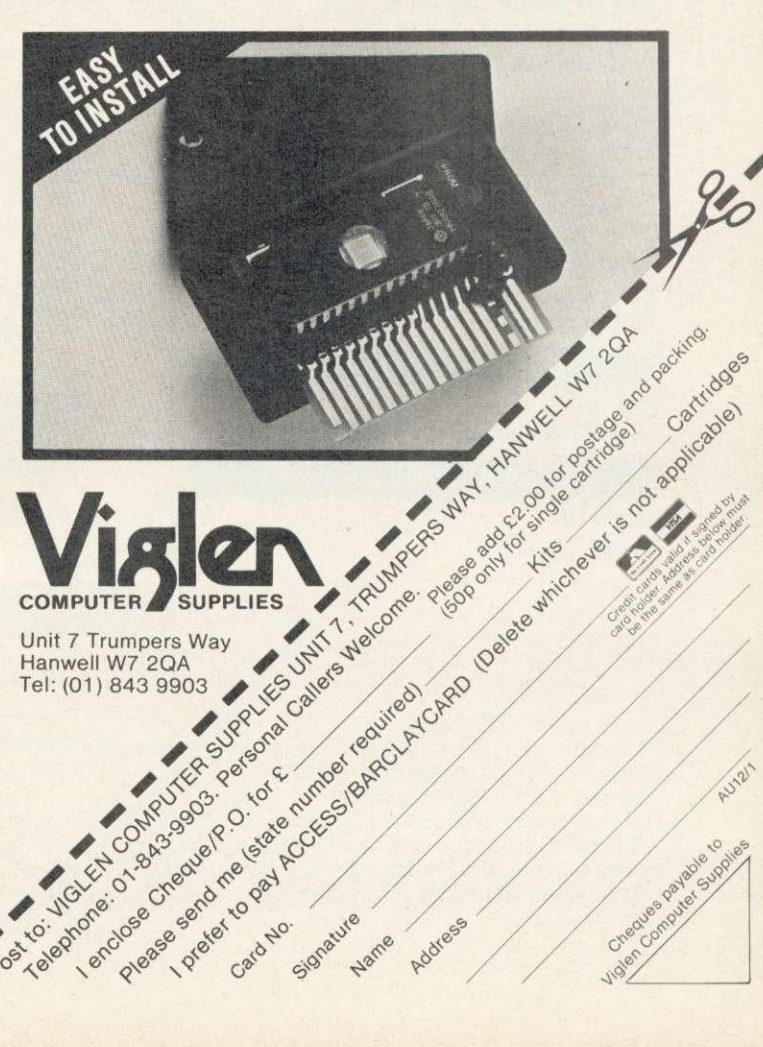


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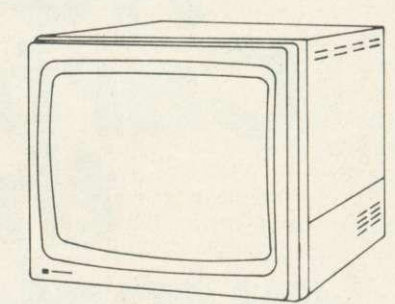


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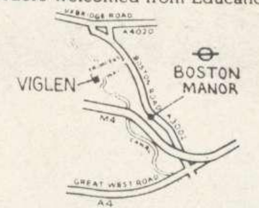
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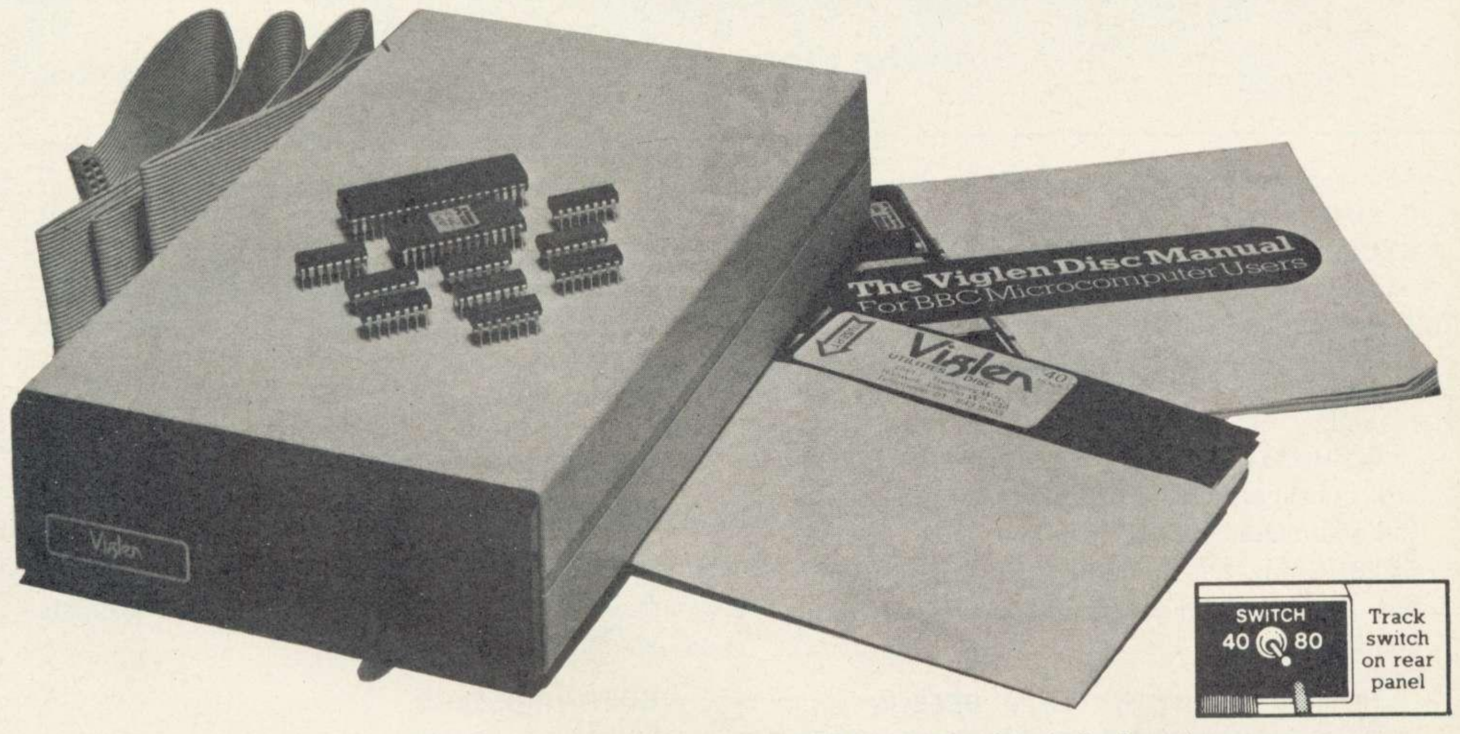
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Science Topics mixes software with video

THE first two software packs in a series of 10 planned to accompany BBC2's *Science Topics* autumn and spring term programmes are now available. *Waves* is a suite of programs on two discs which aims to give pupils simulated experience of wave motion, and *Relationships*, on one disc, is a simulation that casts the pupil in the role of the medical control officer in an African village.

Three more packs will be ready for the spring term: *Bonding, Electronics* and *Electromagnetic Spectrum*. The series will be completed in 1985/6, with three more available for the September term (*Ecology and Conservation, Macromolecules* and *Newton and the Shuttle*). The final two packs will be *Periodic Table* and *Food and Population*.

The 10 packages have been designed to complement the weekly TV series and work with it towards a common purpose, although TV films and software can be used on their own. The 20 programmes in the TV series are aimed at 14-16 year-olds following O-level and CSE syllabuses. They last for 20 minutes each and are transmitted on Tuesdays at 1.15pm and repeated on Fridays at 9.30am.

The strength of the *Science Topics* combination, says series producer Dr Peter Bratt, is that it fixes strong visual images of the real world in the pupil's mind, thus making the interaction demanded by the software simulations and experiments 'more relevant and meaningful'.

'TV can excite,' he says, 'and bring the real world into the classroom, but it is not interactive; CAL may not be real, but users can ask "what if" questions. Combining the two produces more than the sum of its parts.

'Thus if a child watches scenes of an African village and is concerned to see people suffering from malaria, his or her role in the simulation as medical control officer will seem much more relevant. The pupil is able to make decisions and see what effect these have on malaria levels.

The software – all disc-based – has been developed by the Computers in the Curriculum Project at Chelsea College, and has undergone extensive trials in schools. Peter Bratt says no previous knowledge of computers is required by the teacher: 'The programs are menu-driven, using inverse video and single-key operation, and a function key strip is supplied in the software booklets.'

The software is not copy protected. Dr Bratt is worried that there will be a risk of being pirated but feels it is less important than giving the teacher the facility to modify the models supplied.

In the classroom the software will be worked by small groups of children at a time, so that a lot of time is spent away from the computer, planning and analysing results. Pupils are encouraged to use screen dumps, keep record sheets and make notes, and in the *Bonding* package the computer keeps a database which the pupils can sort.

Films and software are linked not only by theme and treatment – the graphics used on the films were done on a BBC micro.

The project embodies pioneering work. 'The latest scientific ideas,' says Peter Bratt, 'have been brought to bear on both videos and CAL. We've consulted the world's leading authorities on genetic engineering, for example, and we're using the most up-to-date examples of real-life science and technology.'

Teachers can order the *Science Topics* CAL software packs, costing £14.95 (plus VAT), from BBC Publications, Schools Orders Section, 144 Bermondsey Street, London SE1 3TH. They are also available through the normal retail outlets.



AERIAL shot of Slapton Ley nature reserve, South Devon, which features in the Science Topics TV film on 'Ecology and Conservation'. The CAL software companion to the programme takes the form of a management game in which the user has to take into account the conflicting opinions of interest groups concerned with different aspects of natural life on the reserve – the fish, the reed beds, the birds and the otter population. The most successful player makes improvements with the minimum of disruption.

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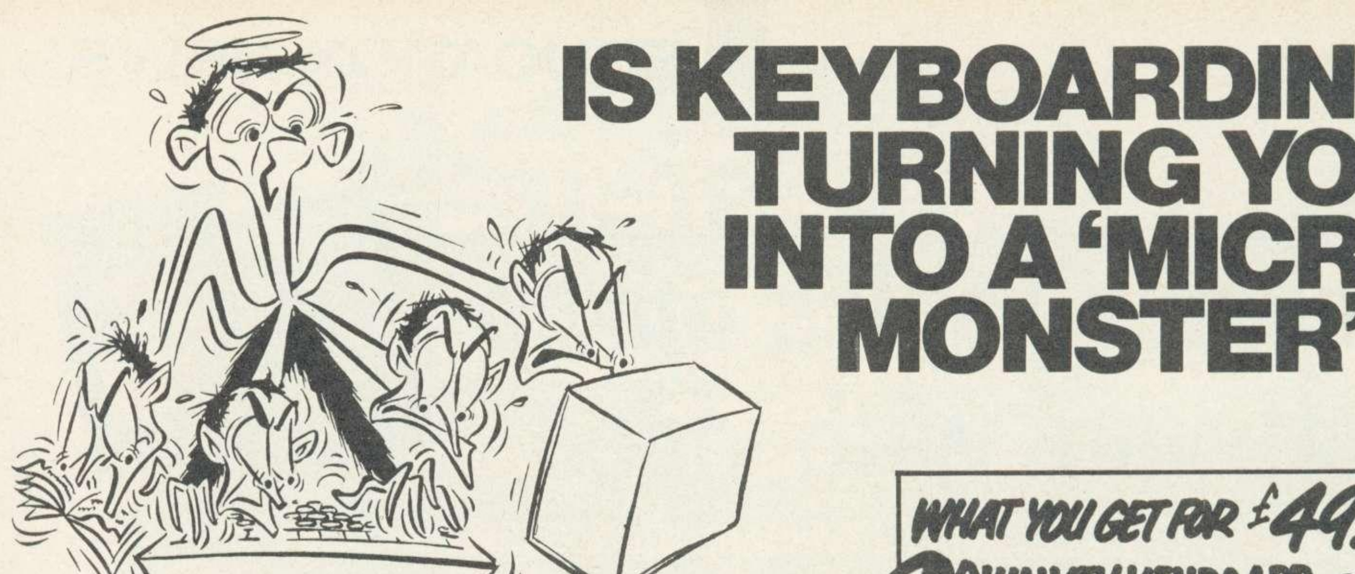
Fifteen 'Science Topics' CAL software packs *must* be won!

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The series is aimed at O-level and CSE science students – and so is our Sci-Quiz. Write your answers on a postcard and include details of your age, form number, school and school address and send it to Sci-Quiz, *Acorn User*, 68 Long Acre, London WC2E 9JH. It must reach us on or before Friday, January 4, 1985.

The first correct entry to be picked out of a hat will win five CAL packs, the second wins two packs and there will be eight third prizes of one pack each. Winners will be announced in the March issue (published on February 21).

1 What insect carries the malaria parasite?
2 Which have the longer wavelength, bass notes or treble notes?
3 How many electrons are there in the outer shell of a chlorine atom?
4 Which machines get their name from the Czech word for 'worker'?
5 What is the formula that relates the frequency and the wavelength of a wave?
6 What is the general name for animals that feed on other animals?
7 What do the initials PVC stand for?
8 What is the name given to the back pack used by the NASA astronauts to fly around outside the Shuttle?
9 Name one element which has similar chemistry to sodium.
10 Approximately what is the population of the world today?



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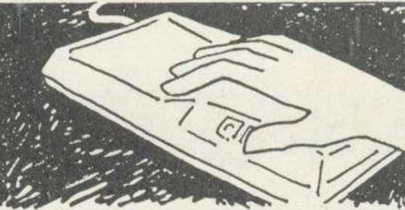
Let's face it, your BBC Micro is a demanding creature. Powerful it may be, but using the keyboard is probably a lot harder on *YOUR* system than you expected — and it's all because you're forced to 'hunt and peck' amongst 74 keys, on a keyboard that's a hundred years old!

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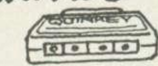
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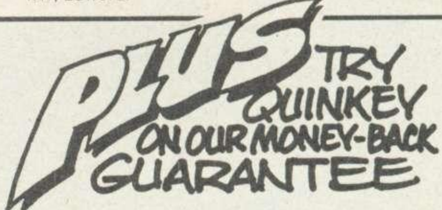


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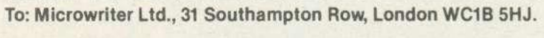
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AU 12/84

Calling all micro junkies

A CLAIM that must have brought a few teachers to an abrupt halt in the middle of preparing computer-centred materials for their classes was that many children risked becoming computer-addicted both at home and at school – to the obvious detriment of their education. Not only that, the computer is ruining marriages throughout the country as the computer 'fiend' – usually the husband – disappears into the study with his new mistress until 4 am.

What wasn't said in the reports, published both in this country and abroad, was that research into the subject had just been started at the University of Technology, Loughborough, and the researcher, Margaret Shotton, is concerned that conclusions are being drawn from the fact that certain areas are being investigated. She expressed her frustration with the press and said she had been grossly misquoted.

The aim of Ms Shotton's research is to find out whether there is a significant problem in the areas outlined above and she'd like to hear from anyone with relevant information.

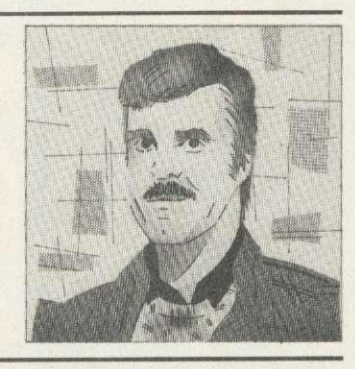
As yet she has been unable to interview any children and would welcome the opportunity to do so. Similarly, adults – families – who have experienced problems would be able to contribute to this research.

As yet interviews have been limited to middle-class couples, probably since computing tends to be a middle-class occupation. With children, however, the social classes are bridged by contact with the machines at school.

If you have information to offer and are willing to be interviewed contact Ms Shotton at the Department of Human Sciences, University of Technology, Loughborough, LE11 3TU, tel: (0509) 263171.

DIY CAL

Commentary by Nick Evans, who welcomes reader feedback



THE preparation of classroom materials for use either with the computer or separately has become the subject of several programs on the market. Packages such as Wida Software's *Questionmaster* or *Choicemaster* makes CAL preparation a straightforward task. 'Authoring programs', as such software is appallingly called, are probably of more use than any other kind to teachers of almost any subject and, once the initial operating skills are learned, the member of staff will be able to manufacture his or her own software to fit the particular situation being dealt with.

A good general package of this kind is entitled 'Clues' and comes with the Longman *Micros in the Primary Classroom* kit, Module 3 – Managing the Micro. 'Clues' is a text-handling package allowing the user to create a passage of text and then flag particular words so that when the computer comes across them it will perform a particular function assigned to that flag. So, for example, the piece of text in figure 1 may be then flagged

```
Jack and Jill went up the hill
```

Figure 1.

```
Jack and Jill went up the hill
*        *    S           D
```

Figure 2.

with other characters as shown in figure 2.

These flags are now assigned particular operations so the '*' may mean 'Replace each character with a star', the 'S' – 'Scramble the letters' and 'D' – 'Delete the word and replace with three dashes'.

Whole sentences and even paragraphs may be scrambled and also individual words may be flagged to be highlighted in colour. The use of this sort of exercise for understanding the workings of language and for exploring the child's ability to deduce information from given facts is limited only by the teacher's imagination, and applications have been found for it in many different subject areas.

Another package of much greater sophistication is Acornsoft's *Microtext*, developed by the National Physical Laboratory (reviewed in the October issue). The ROM-based version will apparently be capable of interfacing with a video disc for random access of video material.

Education in general and *Microtext* in particular are likely to be the saviours of the video disc industry, which took off like a lead balloon in the bright glare of publicity. The big limitation of video *disc* as against video *tape* is that the disc is read-only – there is no facility for recording your own images and so the consumer has eschewed the higher-quality disc picture for the flexibility of the tape. When the educational benefits of random access storage of video material were realised, however, people began to take the disc seriously again and the first permanent interactive video centre (which opened last week) is at the Council for Educational Technology, 3 Devonshire Street, London W1N 2BA.

If you have developed any materials using the videodisc then write and tell the rest of us!

Quinkeys in the classroom

'CLEARLY He had only one keyboard in mind when He designed the human hand' – thus Microwriter's Quinkey advertisement and, when you consider the claims that are made for the device and the good notices it has so far received, you wonder if they don't have a point. Peter Voke's review of the Quinkey in the September issue was quite complimentary and indicated that future trends in computer design are going to mean that miniaturisation will probably cause manufacturers to plump for a system like the Quinkey for pocket computers. But is it working in education? The educational package for interfacing four Quinkeys to the same Beeb and thereby sharing a split screen seems to be a good idea – albeit cramped – but how does it work out in practice?

Are there any Quinkey devotees bursting to tell us about it? In particular, what sort of materials are you using with it and did you find any significant problems in adapting programs?



How does the four-Quinkey package work in practice?

Scheme ends

PRIMARY schools that have not taken up the Department of Trade and Industry's half-price computer offer have only until January 11, 1985 to do so. Every primary school is eligible for this package and LEA computer advisers should be contacted for further details.

EXPLORING ENIGMAS

Nick Evans reviews a suite of programs which investigate the environment in maps and words

THE Dudley Programs make up a suite of software designed to cover a wide-ranging band of topic work within the junior/middle age range. They are divided into broad theme areas as follows: Weather, Travel, Exploration, Myself, Food, and Homes. Within each theme area four main subjects are dealt with by the programs: Maths, Environmental Studies, Science and Language.

Previous offerings from Five Ways Software have tended to be high on ideas but low on presentation and visual impact, especially in the secondary sector. These programs certainly reverse that trend, for they give the child not only excellent visuals but also a high level of accuracy and of training technique. The objectives of the programs have obviously been carefully considered and the presentation of the material makes using the software easy for both pupil and teacher. One reservation on ease of use, however, is that if you are using tapes of these programs you must endure the interminable loading time that Five Ways thinks necessary to prevent us getting our sticky fingers on its code.

In this review we deal with one theme – that of Exploration. The concepts of mapping our environment and thus being able to control it are put forward strongly in this set as we battle with the enigma of the Pharaoh's Tomb, puzzle over the intricacies of Ordnance Survey co-ordinates, scan the heavens for our astrological signs and constellations and, finally, explore the world of books and words in the Librarian/ Wordfinder package.

'The Dudley Programs Exploration Theme', Heinemann Computers in Education/Five Ways Software, BBC, £33 plus VAT (available individually at £9.25 each)

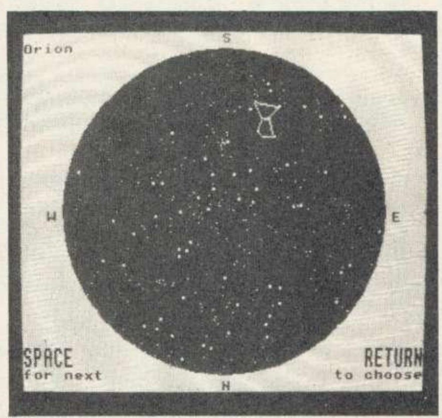
Tomb Adventurer

As you enter the tomb a stone slab seals the entrance behind you, cutting you off from the outside world. A 'magic map' appears on the floor and, using this, you are able to navigate your way first to the treasure and then to the exit. The trouble is that you need to memorise the instructions. You may re-inspect the map but you lose points for that. Once you reach the last point of your expedition the 'magic word' has to be guessed – with the help of an anagram – and you thereby free yourself. The magic words, needless to say, are the names either of great explorers or of their objectives.

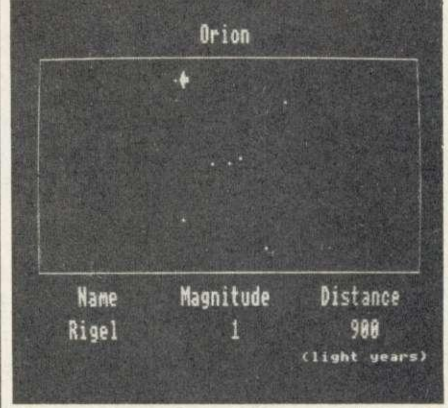
On the screen is displayed the magic map which shows the pupil's position in the chamber relative to points T and E, the starting points for the discovery of the treasure and the exit. When the pupil has digested the instructions the map disappears and he or she is left with a view of what can be seen in the chamber – represented by a simple line drawing – and a compass that revolves in a most friendly manner to show which way the user is pointing. Moving to T and E is probably the most difficult part of the operation and the child needs to be well organised – first tries are usually chaotic, interspersed with frequent references back to the map, up-dated to show present position. The controls for movement are simple and the problem lies not in the operation of the program but in the orientation itself.

As with all these programs, the teacher is able to control the level at which is is used – in this case whether a four- or eight-point compass is used; how many rooms have to be explored; whether the compass rose moves or remains stationary with only the needle moving, and also whether north is shown on the original map. The level of difficulty attainable by juxtaposition of these variables is quite astonishing – as is the ability of the children to surmount the problems.

An excellent program with much to commend it in presentation, planning and the way it meets educational requirements.



Star map showing the position of the constellation of Orion from the 'Star Gazer' program.



You can choose to look at a constellation in detail, and ask for information about its component stars

Star Gazer

On starting this program the pupil will be asked for the exact time of day, month and year on which he wishes to inspect the sky. Regardless of whether it is day or night the constellations in view will be shown. The time-scale covers the decade beginning in 1983. Having selected the time the star map

may be presented showing, as astronomical convention requires, the night sky with north at the base of the picture as if one were looking upward from a north-facing position. By stepping the program along using the space bar, the user may see each of the major constellations drawn in with joining lines. If closer inspection of a constellation is required then pressing Return will clear the screen and the constellation will be drawn in enlarged format. Lines may be added to it so that the original outline that gave the constellation its name can be seen; the Zodiacal sign associated with relevant constellations may be displayed – good line drawings these; or the component stars of the constellation may be highlighted and information about name, magnitude and distance from Earth in light-years printed.

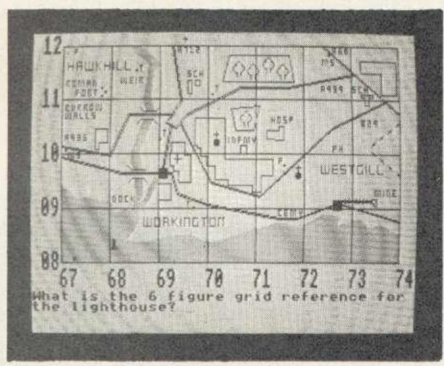
I was amazed by the amount of information that had been crammed into this program. I think its applications will range much further than being used by junior/middle schools and that further ventures along the same lines will grow out of its design, perhaps dealing with the solar system itself and the inter-relation of the planets and their moons. Excellent value and an absolute must for any young astronomer wanting to find his way around the universe.

Mapping Skills

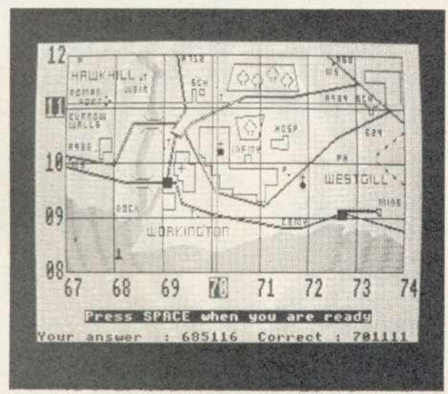
The teaching of grid reference on Ordnance Survey maps is performed most persuasively by this program, which initially presents the pupil with a choice between coastal and urban landscape and, when the choice has been made, draws a small section of the relevant type of O.S. map. The compatibility with the real man and its symbols is quite high, although the delicacy of artwork can never be truly replaced by computer graphics, no matter how high the resolution. Five Ways appears to have developed several new character sets for these programs, one being a fairly accurate rendering of the Times fount. Similarly, a character set has been designed which fits in with the style of the graphics. The overall effect is most satisfactory.

What happens next is governed by the choices made by the teacher earlier in the program. For example, whether the grid should be numbered on the horizontal axis, or lettered; whether four-figure or six-figure grid-references should be used; how many questions are to be asked; how great a margin of error is allowable in the pupil's attempt at grid-reference.

The pupil is then asked for the references of one of the features on the map – he has to recognise basic Ordnance Survey symbols. When he has entered it the machine will either respond with "Correct" and move on to the next question or, in the event of error, demonstrate the incorrect reference and the correct one by means of coloured grid lines, which move across the screen in an easy-to-follow manner. My volunteers found this routine not only easy to follow but dynamically riveting – good attention-fixing stuff this!



In 'Mapping Skills' the child is asked to give the grid reference of a feature



If the wrong answer is given the micro supplies the correct one

Librarian

I have a feeling that most people, when presented with this program, would rather see children performing the tasks using real books in a real library. Use of the computer for simulation purposes is fine when it frees resources for others or enables people to handle concepts normally unattainable. In this case, however, not much is done that couldn't as well be done with worksheets or practical supervised work in a library. Yes, I know it's self-checking and it frees the teacher for other things but. . .

The program presents the user with a set of volumes to be sorted into alphabetical order – the teacher determines how many volumes. Pressing the f-keys moves the volumes around and Return enters the final offering for assessment. Sorting may be done on the basis either of author's name or on the Dewey reference number – I was alarmed by the three-figure decimal references which would rarely appear in a junior/middle library and not very frequently in a secondary library. Level of difficulty can again be specified – whether the sorting is based on the first, second or third letter. In addition to this is an encyclopaedia routine in which the child is asked to indicate the volume that would contain a particular subject area – alphabetical sorting skills again.

I was disappointed with this offering. It seems to be a bit of a make-weight in an otherwise excellent suite, even though it did fit in with the theme of exploration.

Word Finder

If Roget's Thesaurus could be usefully put onto computer it would be in this form, a vocabulary-handling program with lateral linking. Unfortunately, however, the user must be content with the vocabulary presented, as it's unalterable. A program allowing linking of vocabulary and building of lists might have been much more useful, although probably difficult to produce.

The theme of exploration is covered by the vocabulary, starting, logically, with the main components of any expedition – people, places, equipment etc, and then branching away to develop each of the areas individually as they are chosen by the user. An indication is given if a 'lateral' link can be made by a < or > next to the word concerned. Pressing the cursor keys makes the link. A Dewey reference number is attached to some words, allowing further research to be made on that topic.

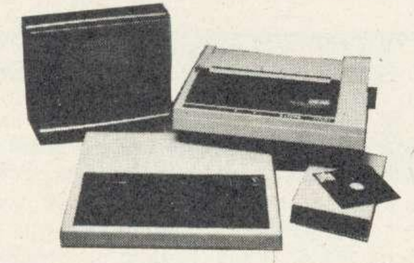
The teacher is able to add the reference numbers to more of the words by a routine which has to be reloaded each time the file is used – why couldn't Five Ways have allowed the user access to the original Data file of vocabulary so that the loading of yet another section on top of their already mind-warping loading routine could have been avoided?

Reaction to this program was much the same as to *Librarian*. Why not use a book? Why not create your own lists of vocabulary? Isn't a book quicker? The main complaint was that no alteration could be made to the content of the program. Perhaps this might be a further development – a content free thesaurus, ready to be filled.

Conclusions

This complete suite of programs is well worth the £33 plus VAT asked for it. The programs are available individually at £9.25 plus VAT, but they hang together well as a theme project set and I think that their use would be greatly enhanced by using them as a suite.

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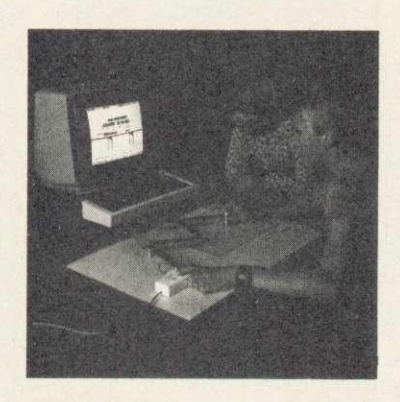
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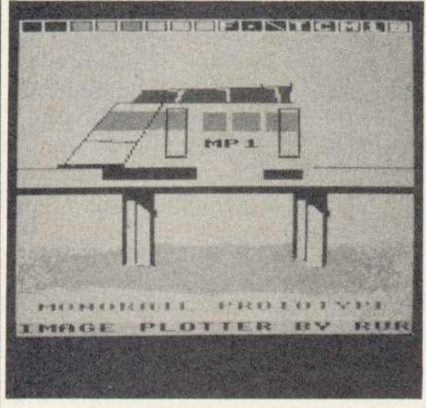
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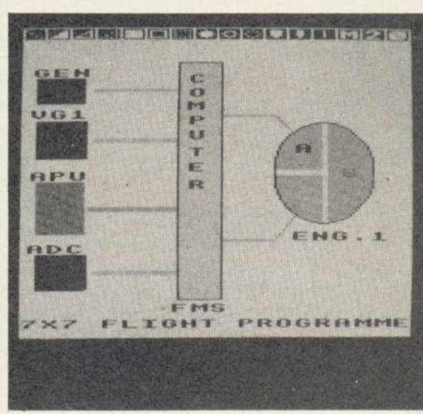
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LOGICAL LOGO

Nick Evans speaks well of the new Acornsoft implementation

Logo, Acornsoft, (0223) 316039, £60

DID you know that greedy primitives are needed to tell turtles? No? Then read on, as these are all Logo expressions.

Logo, the language developed by Seymour Papert and his fellow researchers at the Massachusetts Institute of Technology, has had many emulators – some good, some downright ridiculous. Acornsoft's offering, however, is in another league. It bears as much resemblance to many other packages as the Space Shuttle does to the bicycle.

This is a full implementation of the language, using the wide and powerful facilities of the BBC micro to the full. Papert's vision was of a world where every child would have a powerful micro from the age of about four and, through its use, would develop an understanding of those concepts which are often taught slowly and poorly by conventional means. This software makes a positive contribution to that ideal.

The first indication of serious intent on Acornsoft's part is that this package consists of two ROMs, a disc and a massive amount of clear documentation. For most people who have made any additions to their micro, the two ROMs will mean an expansion board as well – but if you use Logo in your classroom, the trouble will be well worthwhile.

Every effort has been made to ensure that the user will be able to find his or her way round the language as quickly and easily as possible. Two manuals are supplied – one for those totally new to the idea of computing and Logo, the other for those who are familiar with programming but not with Logo. The user will find that the structures, the keywords (or primitives as they are called – and there are over 200 of them) and the methodology are all expounded in simple terms.

All the usual facilities a Logo programmer would expect have been built into this package, so the language is quite compatible with other systems, and should be able to run a good deal of existing Logo software. However, because of the strides forward made in computing since it was first mooted, much has been added to the original concept – not least the implementation of BBC graphics modes.

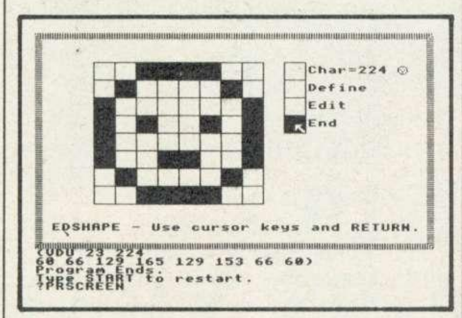


Figure 1. The character definition program

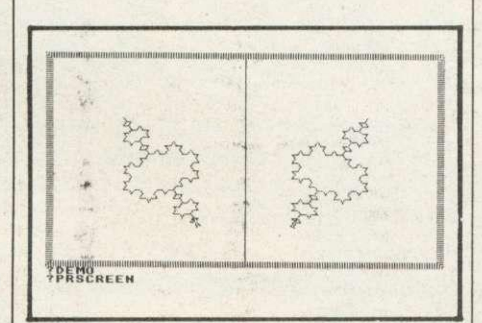


Figure 2. An example of the mirror facility



Figure 3. A program to draw letters on the screen

Machine code routines and all OSBYTE calls are fully accessible from Logo. The package is compatible with all the existing floor turtles on the market (Buggy, Valiant, Jessop, etc), and it provides hard-copy facilities for a range of printers, allowing a very rapid screen dump to be executed (just under one minute) whenever the machine is in Command mode. The illustrations with this article are all from an Epson printer.

The 6502 second processor is also compatible, as are joysticks and other analogue functions, sound and all the range of VDU commands. A character definition program is included on the disc (figure 1).

Those facilities which are external to Logo and extend its range (eg floor-turtles), are termed 'extensions' and are loaded into the workspace either before or during normal program operations. A separate booklet explains their use and operation.

Logo has always been considered by the layman as a language for drawing pretty shapes on the screen, exemplified by children sitting around a monitor producing glorified Spirograph patterns. The programs in this package dispel that illusion immediately. Yes, the graphic work is there in all its finery, more detailed still because of the possibility of multiple turtles – you HATCH the things – and there is a perspective function, as well as a mirror facility (figure 2) which places two turtles making mirrored images on the screen. However, there is also a good deal of text and number work, often combined with the graphics to provide interesting and stimulating examples.

As well as the usual text facilities it's possible to draw letters on the screen using one of the programs supplied (figure 3). Their size is determined by input of a number from one to 10. All the normal Logo functions will operate so that the screen may be labelled using this program.

The ability to create a specific Logo 'environment' is central to the principles of the language, and you do this by restricting or extending the facilities offered by the machine – for example, you may wish for single key-presses to represent a particular command, or to 'hide' some of your procedures so that they cannot be analysed by the user. These and other facilities allow you to create an environment which is tailored to the needs of the particular task.

Logo may not be the fastest language around – some of the examples seem very slow. Its most important feature, however, is that it grows in a logical pattern from a starting point easily understood by small children. That is the secret of its success and, with this implementation, a child may now grow up with a version which fully exploits the BBC micro.

PASCAL POWER



Acornsoft's first major compiled language for general use is out now. Simon Williams takes a look

ISO Pascal, Acornsoft, BBC (with or without 6502 second processor), £69, and Electron (price to be announced)

IF there's one area of software production at which Acornsoft has always excelled, it is in the programming language. BBC Basic, despite some minor irritations, has proved one of the best and most robust implementations on any micro. Now we have the first major compiled language released for general use (BCPL being largely intended for specialist applications programming).

ISO Pascal is the language finally arrived at (after much deliberation) by a committee of the International Standards Organisation. The Acornsoft versions (there are three, intended for different environments) adhere closely to the standard, with minor omissions, mainly due to space constraints, and some extensions to allow for machine specific graphics, sound and keyboard commands.

The package consists of two manuals, a function key strip, a disc of utilities and 32k of code, supplied in two 16k ROMs for the basic BBC micro; a language disc for the BBC plus 6502 second processor; or a ROM cartridge for the Electron (which obviously requires a Plus-1 extension to be fitted). The 32k is divided equally between an extremely comprehensive editor and the Pascal compiler, which is itself written in Pascal. The package under review is the ROM version supplied for the BBC micro, but all the facilities covered are also provided in the other two packages.

Having installed the ROMs – an easy job for anyone who's delved into the machine before (Acorn dealers will do it for you if you are timid) – typing *PASCAL from Basic will take you straight into the language and provide the % prompt, used throughout the system. The Pascal editor is entered by typing EDIT and presents a blank page with a cursor at the top and a single status line at the bottom.

The facilities offered by the editor are very sophisticated. As well as being a full screen editor it allows block copies, moves and deletions and all manner of search and/or replace operations, including the use of wild cards. In use, the editor reminded me most strongly of *Wordwise*, and some functions, such as cursor control, are identical to this wordprocessor. If the Pascal editor had included automatic word-wrap I could have written this review using it.

This kind of sophistication in a language editor may seem excessive,

'The user manual is not something for the uninitiated'

until you remember that Pascal is a fully compiled language, taking its source code and converting it, once and for all, to an object code equivalent. A good editor will therefore greatly speed the production of the source code and, since Pascal also dispenses with line numbers, it provides an efficient way of handling a large program.

Nearly all the editing functions not directly obtained from the text or cursor keys are provided by function keys f0 to f9, with or without the use of Shift or CTRL. This is very convenient to use, although the review copy didn't have a key strip – it was a question of delving into the manual to find out what was what.

The compiler may be called from Pascal command mode, to which the system reverts on leaving the editor. The compiler overlays the editor and then tries to make sense of your source code. A number of different compiler options are offered, including one to produce object code or not (useful for quickly checking errors in long programs), listing the source code and providing full error messages or only their code numbers. Error messages are held as a text file on disc, so if you are working with tape you'll have to refer to the appendix in the manual, where all 168 of them are listed. Between them they should give you a good idea of what's wrong (if anything). There are a further 34 messages, which may be generated by the 'run-time' system when you try to execute the object code.

The user manual is a detailed affair and not something for the uninitiated – mind you, the same could be said for Pascal. It gives full information on the editor and compiler, and there's a comprehensive index and a quick reference chart in the appendices. There will also be a copy of *From Basic to Pascal*, an introduction to the language itself. This was not available for review.

Acornsoft's ISO Pascal appears to be a comprehensive (although somewhat daunting) implementation of the language. At present the compiler will produce only an intermediate code, which will not run without the 'run-time' routines present in the machine. There are priority plans to produce a separate run-time generator to allow stand-alone operation. Without this facility, the market for the product may well be restricted to schools and colleges (the system is compatible with Econet) and a few wealthy enthusiasts. With it, there would seem to be ample opportunity for Pascal to be used in the production of commercial programs.



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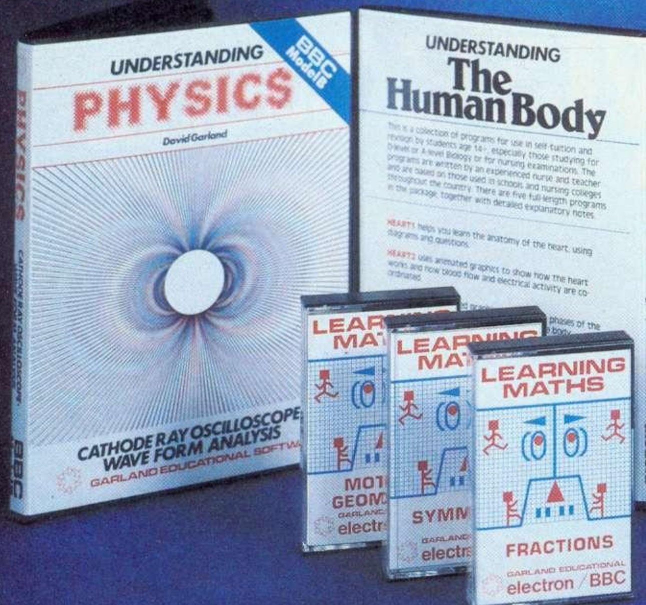
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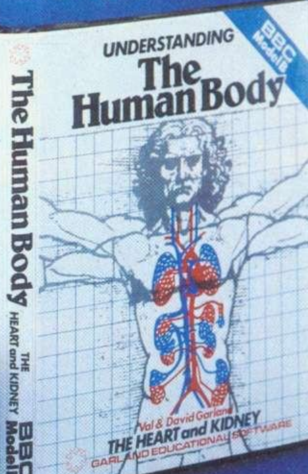
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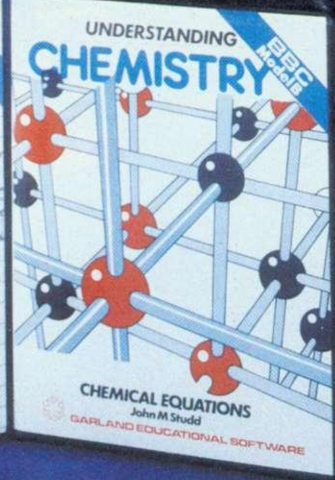
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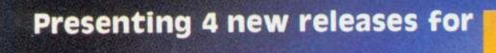
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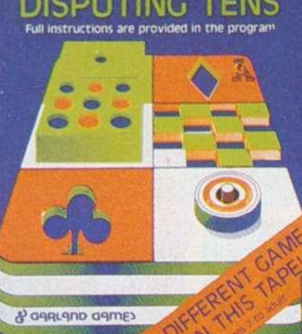
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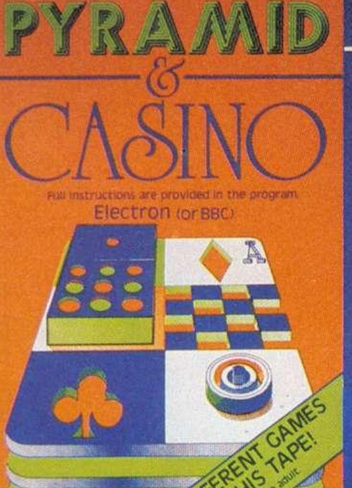
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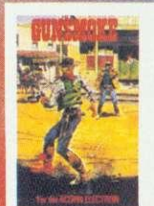
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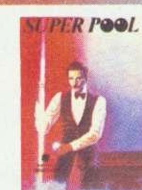
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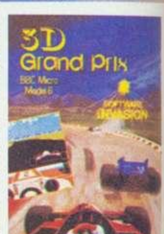








SOFTWARE CHART

	TITLE	PUBLISHER	PRICE	MICRO	REVIEWED
1 (—)	Elite	Acornsoft	£14.95 (£17.95)	B/E	October '84
2 (2)	Fortress	Amcom	£8.95	B	September '84
3 (4)	Football Manager	Addictive	£7.95	B	
4 (9)	Aviator	Acornsoft	£14.95 (£17.95)	B	May '84
5 (1)	Frak!	Aardvark	£7.50	B	September '84
6 (3)	Micro Olympics	Database	£6.95	B	
7 (5)	Blagger	Alligata	£7.95	B/E	October '84
8 (—)	Chartbusters	Alligata	£9.95 (£13.95)	B	
9 (—)	Jet Pac	Ultimate	£7.95	B	
10 (—)	Sinbad	Virgin	£7.95	B	
11 (6)	Overdrive	Superior	£7.95	B	September '84
12 (—)	Gisburns Castle	Martech	£7.95	E	
13 (—)	Scrabble	Leisure Games	£8.95		
14 (re)	Battletank	Superior	£7.95	B	September '84
15 (8)	Ghouls	Micro Power	£7.95	B/E	June '84
16 (—)	Eagle's Wing	Software Invasion	£7.95 (£11.95)	B	November '84
17 (—)	Tarzan	Alligata	£7.95 (£11.95)	B	
18 (—)	Chess	Micro Power	£7.95	B/E	
19 (re)	Twin-Kingdom Valley	Bug-Byte	£9.50	B/E	
20 (re)	Cylon Attack	A&F	£7.95	B/E	April '84

B=BBC. E=Electron. re=re-entry. Prices in brackets are for disc version.

BUBBLING UNDER

Galaxy Raiders (Visions)
Star Seeker (Mirrorsoft)
Stock Car (Micro Power)
Laser Reflex (Talent)
Son of Blagger (Alligata)
System 15000 (Craig)

Compiled by RAM/Computer

WHAM! Straight in at number one comes the best game ever for the BBC micro – *Elite*. And if you don't believe our editor, go along to a dealer and take a look.

The other big event this month is the number of new entries – nine in all plus three re-entries. Christmas must be coming. And readers looking for presents to please their manic game-playing acquaintances need look no further than our Hit List on page 188 where *Snapper* author Jonathan Griffiths gives his best games of 1984.

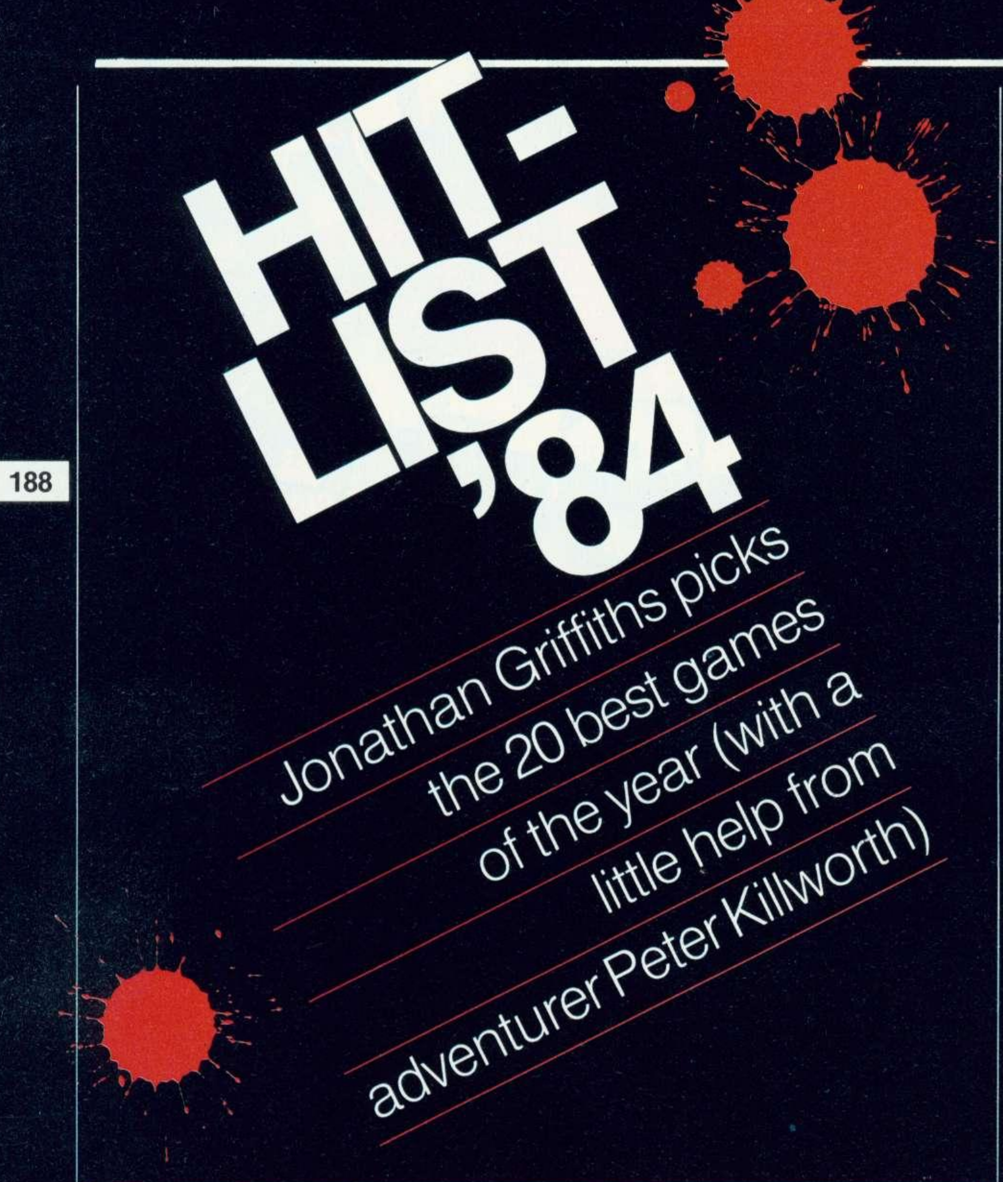
Software house of the month in terms of numbers is Alligata with two new entries joining the excellent *Blagger*, with the remake, *Son of*, looking as if it will follow its illustrious ancestor.

Virgin, who we've had a go at over the past year for games which don't exactly set the world alight, might have come good with *Sinbad*, although we must confess to not having seen it.

The trend towards disappearing adventures is confirmed this month with only one, in evidence. However, if Acornsoft's *Acheton* is as good as our reviewer Peter Killworth thinks, perhaps things will look up in the New Year. Also, a proper adventure based on TV's *Doctor Who* written by Peter Voke is coming out from BBCSoft. And then there's *Return to Eden*, Level 9's sequel to *Snowball*.

But the big question is whether British Telecom's policy of pricing games at £2.50 will come off and catapult them into the charts, because at that price they're going to have to sell in big numbers.


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BEST ARCADE GAMES 1984

1 **Elite** – Acornsoft	11 **3D Bomb Alley** – Software Invasion
2 **Zalaga** – Aardvark	12 **Blagger** – Alligata
3 **Aviator** – Acornsoft	13 **Hunchback** – Superior
4 **Frak!** – Aardvark	14 **Jet Power Jack** – Program Power
5 **Fortress** – Amcom	15 **Overdrive** – Superior
6 **Missile Control** – Gemini	16 **Micro Olympics** – Database
7 **Pengo** – Watford Electronics	17 **Ghouls** – Micro Power
8 **Killer Gorilla** – Micro Power	18 **Snooker** – Visions
9 **Hopper** – Acornsoft	
10 **Chukkie Egg** – A & F	

BEST ADVENTURE GAMES 1984

Snowball – Level 9	**Acheton** – Acornsoft

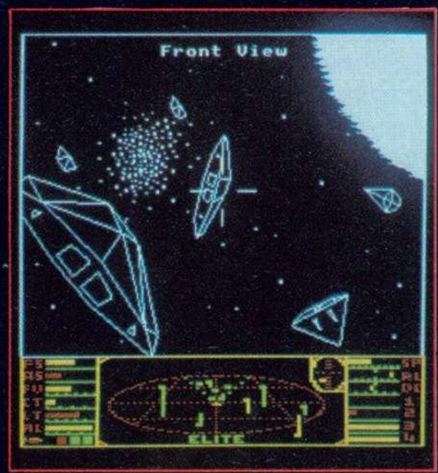
GAMES over the past year have shown some remarkable innovations, representing radical departures from those of the previous year, which were largely sprite-based and used fixed screens. Although the old favourites will continue to sell, the games that have been stealing the limelight are the ones that are seen to advance the techniques.

However, it is not only technique and technical innovation that make a game good. It is also an indefinable 'addictiveness' that a game must have if it is to be played for more than the first week.

The chart shows what in my opinion have been the outstanding arcade games of the year, and Peter Killworth has picked what he regards as 1984's two outstanding adventure games.

All these games played a part in making 1984's batch of games excellent. Some were more successful than others, either at making a name for themselves or by selling well (which isn't necessarily the same thing). Also, some of these games were around in 1983 but are still going strong and influencing the charts.

Elite is *the* game of 1984, and very probably of 1985 as well. No other comes anywhere near it for complexity, quality of graphics and speed. It is also one of the first arcade games to make use of the disc. The graphics on this are

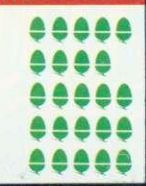


out of this world, and the speed is truly stunning. Also, just to make sure things don't pall after you've mastered the spaceship (by no means an easy task), you have to defend yourself against any pirates that may be around. Then you have to journey around the galaxies (eight of them), making deals (you can trade with the various worlds), blasting pirates (or perhaps becoming one of them!), and generally having a great time. Just in case this becomes monotonous, the game grades your progress, giving you epithets which range from 'harmless', through 'average' to the ultimate status, 'elite'.

This game is not a flash in the pan, but should herald in a new era of thought-provoking, reaction-testing games, having as it does the addictiveness of *Dungeons and Dragons* (in which one also progresses through levels of ability), graphics and action that are second to none and a sufficient complexity to ensure that players will come back to it time and time again.

RATING FOR ELITE

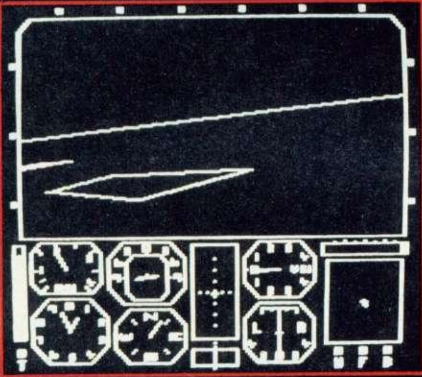
Graphics –
Sound –
Programming skill –
Value for money –
Addictiveness –



Zalaga is one of the fastest games around, and the techniques used (like the way, for example, that the ships always move at a constant speed, no matter how many are moving at any one time), makes this technically excellent. The amount of information held (all the shapes, together with their rotations, plus the re-defined character set) is truly amazing, and Orlando's methods of handling this are superlative. Also, it is very addictive, as the computer employs different tactics with each sheet, which you have to outwit, and one always feels compelled to play again to discover what the next sheet is like.

RATING FOR ZALAGA	
Graphics –	5
Sound –	4
Programming skill –	5
Value for money –	5
Addictiveness –	4

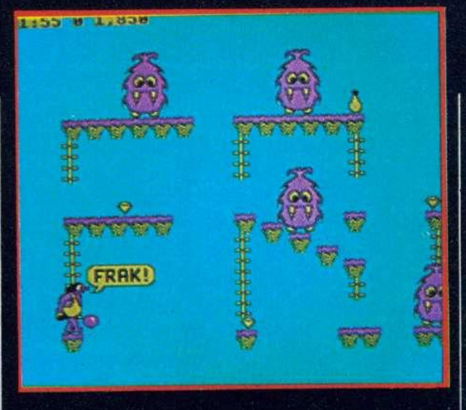
Aviator is now the standard flight simulator package for the BBC micro. The graphics are adequate for the job of giving the pilot some feedback, and response time is impressive. The game is also very addictive – I find myself playing it more than any of the others (except *Elite*). The simulation of flying



an acrobatic aircraft is uncanny, and several pilot friends of mine have praised its accuracy.

RATING FOR AVIATOR	
Graphics –	4
Sound –	3
Programming skill –	5
Value for money –	5
Addictiveness –	5

Frak! is a game distinctly different from any others. There are no hordes of screaming baddies, the player is not equipped with a fast-firing laser ship – and speed is not essential, although dexterity is. The graphics are the stunning thing about this game, with very large shapes moving about smoothly. Also, the idea of being a caveman



armed with a yo-yo is sufficiently off-beat for it to appeal.

RATING FOR FRAK!	
Graphics –	5
Sound –	4
Programming skill –	5
Value for money –	4
Addictiveness –	4

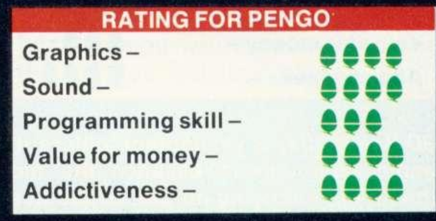
Fortress is a version of the arcade game *Zaxxon* and uses some very interesting techniques to get the screen scrolling. The speed and smoothness of this game are superb, and it is certainly addictive. The graphics are amazing, and the speed at which the landscape rolls past is faster than the arcade version, making it more difficult than the original. All in all, an excellent game, and the only one that I know of that uses diagonal scrolling with a condensed screen.

RATING FOR FORTRESS	
Graphics –	4
Sound –	4
Programming skill –	5
Value for money –	4
Addictiveness –	4

Missile Control is easily the best *Missile Command* game for the Beeb. The whole package is professional: the game is fast and colourful, the graphics have been competently executed, and the game is set to become a classic. It is quite addictive, and as the level mounts the adrenalin starts pumping, which is a good test of how much concentration is required.

RATING FOR MISSILE CONTROL	
Graphics –	4
Sound –	4
Programming skill –	4
Value for money –	4
Addictiveness –	4

Pengo from Watford is a very professional game in the *Pacman* tradition. The catchy tune that is played continuously is just one example of the care that went into it. (For all that, there are still some bugs – such as an egg being positioned on top of the Pengo, which leaves a horrible mess.) This is another addictive game, which people seem to want to play again and again.



RATING FOR PENGO	
Graphics –	4
Sound –	4
Programming skill –	3
Value for money –	4
Addictiveness –	4

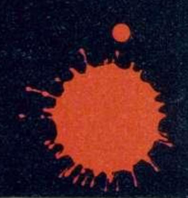
Program Power's *Killer Gorilla* is quite an old favourite now and is beginning to be regarded as a classic game. A game becomes a classic when it establishes itself as the only version on the market. *Snapper* and *Planetoid* did this in 1982 and have since remained the only versions that most people know. *Killer Gorilla*'s graphics are good, and serve their purpose admirably.

RATING FOR KILLER GORILLA	
Graphics –	3
Sound –	3
Programming skill –	3
Value for money –	4
Addictiveness –	4

Hopper from Acornsoft is the smoothest *Frogger* game around for the Beeb. The game is extremely cute, with happy, brightly coloured little cars and lorries, all moving along to the accompaniment of several happy little ditties, which play in the background and which are, thankfully, stoppable – even the best tunes become tedious if played too often. This game is also acquiring classic status, in common with author Neil Raine's other games, *Planetoid* and *Meteors*, released in 1982.

RATING FOR HOPPER	
Graphics –	3
Sound –	3
Programming skill –	3
Value for money –	3
Addictiveness –	3

Chukkie Egg demonstrates how important the addictiveness element is. The graphics on this game can best be described as adequate, and yet people find that they are still playing it months later. The sheer number of different stages in this game make it compelling – you *have* to find out what will happen on the next screen. Also, the way in which you can jump to virtually any point on the screen without the usual effect of being killed is nice, and a distinct step up from most *Donkey Kong*-type games, where being a pixel out when you jump means death. *page 190* ▶



RATING FOR CHUKKIE EGG	
Graphics –	●
Sound –	●●
Programming skill –	●
Value for money –	●●●
Addictiveness –	●●●●

3D Bomb Alley is yet another 'different' game, although in essence the old theme of destroying hordes of baddies is still there. The graphics are the main advance, the attacking bombers being viewed from an anti-aircraft emplacement. The planes get larger and larger, until they eventually drop a bomb that destroys any ships left in the water. During the attack, you must hit them by moving your sights until they are covering an attacker and then fire. This last detail is reminiscent of *Missile Command.*

RATING FOR 3D BOMB ALLEY	
Graphics –	●●
Sound –	●●
Programming skill –	●
Value for money –	●●●
Addictiveness –	●●

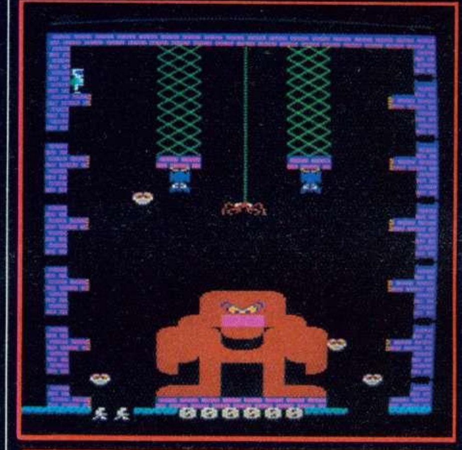
Blagger has 21 different screens, and this variety keeps up interest long beyond the initial learning phase. The graphics are relatively uninspired, although better than those of *Chukkie Egg*, and sufficient to play the game. What is remarkable is their sheer number, as there is not much spare memory after one has decided to use mode 2 graphics.

RATING FOR BLAGGER	
Graphics –	●●
Sound –	●●
Programming skill –	●●●
Value for money –	●●●
Addictiveness –	●●●

Hunchback is a game requiring you to pilot Quasimodo through a heavily guarded castle. This is done by having a fixed screen which scrolls to one side when it is completed. Thus the game has different phases, each of which has to be completed before one moves on. One of the more useful features of this game is the facility to start at any phase, which is useful for practising. All this helps to make it addictive.

RATING FOR HUNCHBACK	
Graphics –	●●
Sound –	●●
Programming skill –	●●
Value for money –	●●●
Addictiveness –	●●●

Jet Power Jack attempts to bring Spectrum-style graphics to the BBC, and mostly succeeds. The shapes are perhaps a shade too small to be clearly seen, and the response of the program to the player's controls is a bit too enthusiastic for me, and I normally go flying across the screen before I've worked out what's going on. However, this speed is probably a plus point when one becomes experienced. The game is firmly in the *Donkey Kong* mould, with a cross-section through the building in which Jack is moving.



RATING FOR JET POWER JACK	
Graphics –	●●
Sound –	●●
Programming skill –	●●
Value for money –	●●●
Addictiveness –	●●●

Overdrive, from Super Software, is graphically quite good, the cars on the track being scaled according to their distance away from the player's car. My only gripe is the lack of corners, which means that most of the skill needed is in avoiding other cars as you overtake them. At high speeds, these other cars appear very fast, and the game becomes almost pure reaction.

RATING FOR OVERDRIVE	
Graphics –	●●●
Sound –	●●
Programming skill –	●●
Value for money –	●
Addictiveness –	●●

Micro Olympics is interesting from the novelty point of view. The graphics (when you get to them – there are rather a lot of instruction pages) are very good, and the man runs extremely smoothly. Unfortunately, the only copy that I have seen of this package was incomplete, in that the Throwing and Running sections didn't exist. However the jumping was good, although it was tricky to judge when to jump.

RATING FOR MICRO OLYMPICS	
Graphics –	●●●
Sound –	●●
Programming skill –	●●
Value for money –	●●
Addictiveness –	●●

Ghouls from Micro Power indicates a new direction for games to follow. I've seen the same game for the Commodore 64, so it was obviously designed to be easily converted for other machines. Perhaps in the future companies will only sell one tape, which will contain versions for all micros, so that the user will wind the tape to the correct position and load the appropriate version. Specialist games will continue to offer better use of the machine. For all that, though, *Ghouls* is fun.

RATING FOR GHOULS	
Graphics –	●●
Sound –	●●
Programming skill –	●●
Value for money –	●
Addictiveness –	●

Snooker from Visions is a faithful rendition of the game, with large snooker balls which move about fairly convincingly. The only thing that I found odd was the bouncing algorithm, as slamming a ball into the red pack didn't produce the normal scattering effect, but instead all the balls absorbed the impact. Other features include the ability to vary the strength of the shot.

RATING FOR SNOOKER	
Graphics –	●●
Sound –	●
Programming skill –	●●
Value for money –	●
Addictiveness –	●

Among the two adventure games that make our chart, Level 9's *Snowball* is to be commended for its logical structure. The features of the game are the amazing text compression – 7,000 rooms fitted into a standard model B. In this game you have to find your way around a large building with separate floors, most of which are connected together by lifts (but not the floor you start in – this is the first puzzle!).

The other game is a new release from Acornsoft, called *Acheton*, which uses techniques devised by Jon Thackray and David Seal. This is one of the first adventures for the Beeb that works only with a disc drive, a disc being necessary to hold all the room descriptions and the pointers associated with them. The game itself is also chock-full of puzzles.

MAKE THE MOST OF YOUR JOYSTICK

When you bought your BBC Model B, or a PLUS 1 or one of the other analogue interfaces for the ELECTRON, then you paid out a fair amount of money for the A/D converter. Don't waste it by buying switched joysticks. ACORN did not put all this additional cost onto the machines without considering its worth against a switched joystick option which could have been run from the user port without any additional hardware.

A switched joystick cannot properly simulate an analogue one but an analogue one can simulate a switched one with extra facilities.

Three types of joystick are around for the BBC at the moment. These are:-

(a) Switched type that plugs into the user port.

(b) Switched type modified to plug into the analogue port.

(c) Fully analogue.

Firstly, don't buy a switched joystick that plugs into the user port. Joystick software for the BBC is written to run from the analogue port. A joystick of this type will need a conversion routine, even to run programs that have an ACORNSOFT compatible joystick option. Conversion software can cause problems, it can interact with the hardware timers in the user port, or affect the speed of the game, or sometimes the conversion cannot be located because all available memory is used.

The switched type of joystick that plugs into the analogue port has been fitted with resistors to give three values in any plane. These values are full on, full off or half way. This type of joystick will run programs which only require up, down, left, right or diagonal movement in one speed.

The type of joystick really intended to be used on the BBC is a fully analogue one. Few programs are around yet which really take advantage of the variable rates and angles that can be used with this type. Two programs that do are AVIATOR and SNOOKER from ACORNSOFT and you need analogue joysticks to play the joystick versions of these programs.

On AVIATOR the joystick replaces the real Spitfire's joystick. A slight movement of the joystick will cause the plane to change direction slowly and a large movement will make it change direction sharply.

In SNOOKER the angle of the shot is directly related to the angle of the joystick and the strength of the shot is determined by the deflection of the joystick from the centre position.

Most things in real life are analogue. For instance, imagine driving a car with only idle or flat out, forwards or backwards and brakes that were either hard on with the wheels locked or not on at all. Imagine picking up an egg with a hand that was either open or fully closed. An attempt can be made to simulate analogue movement with switches by causing the switch to adjust the rate at which something is moved. The keyboard version of AVIATOR is like this—as long as you hold down a key the aircraft joystick is moved in that direction—O.K until you need to suddenly swing the other way because you will have to wait while the joystick is driven back to centre and then off in the other direction.

In the on-going debate as to whether video games are good or bad for young children; one of the "for's" is that they improve co-ordination between hand and eye. This is only true if there is a direct relationship beween the position of the hand (joystick) and the object on the screen. It is not really improving co-ordination if the object moves at a rate determined by software regardless of the relative position of the stick or the pressure applied to it or the speed that is moved.

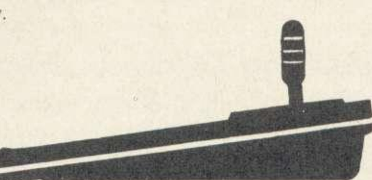
Similarly the absolute position of a cursor in a graphics program is best done with analogue joysticks. The cursor can be moved a tiny bit by making a fine adjustment in any direction or can be put the other side of the screen as quick as the joystick can be moved.

To help you make the most of your joystick we are offering free listings of some useful joystick utilities for just sending us a stamped addressed envelope and returning the enclosed form.

by Tony Pearmain

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2. A utility to convert games like SNOOKER from two joysticks to run on one joystick.
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This program works very well for a single DELTA 14b where each player has his own fire button.
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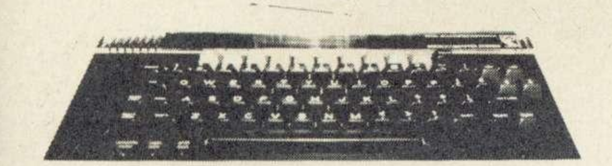
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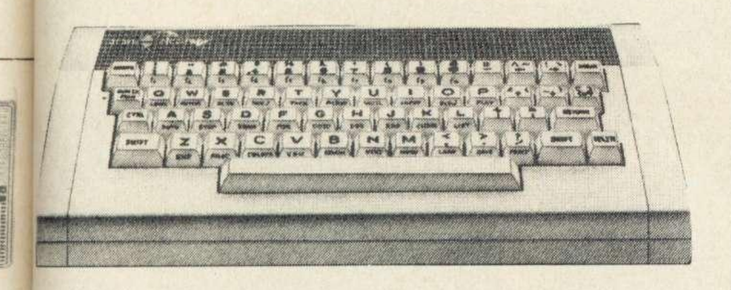
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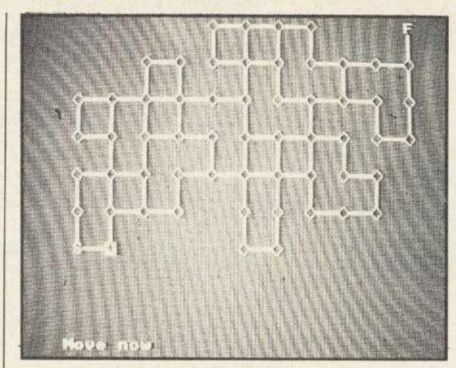
INTO THE ABYSS

'Abyss', Case Computer Simulations, 14 Langton Way, London SE3 7TL. BBC and Electron, £6.95

DESCRIBED as an unusual adventure game, *Abyss* consists of a grid to be traversed. After moving from one section of the grid to another, a random puzzle is set.

These are a mixture of mathematical problems, arcade games and memory tests. The arcade games may sound great but really only consist of, for example, avoiding three blobs which home in on you as they move down the screen. Similarly the other problems don't cause much difficulty, with tasks such as remembering a number of letters in sequence, or answering (within a time limit) if the sum of two numbers is correct.

The graphics are poor and some of the checks on the mazes are terrible – in one case it's possible to come out of the entrance, walk round the maze and reach the exit, thus solving the problem. Another puzzle has a bad feature which means it can only be completed on its second occurrence. It begins with



a few lines of instructions to be read at the top of the screen. The object is to read a word flashed on the screen, but as this appears simultaneously with the instructions it's impossible to accomplish on your first attempt. Other difficulties are caused by bad combinations of colours which can only be read on clear monitors or monochrome TVs.

Abyss is just a collection of small tasks which any semi-competent programmer could write, and really should not be sold under the title of 'adventure'.

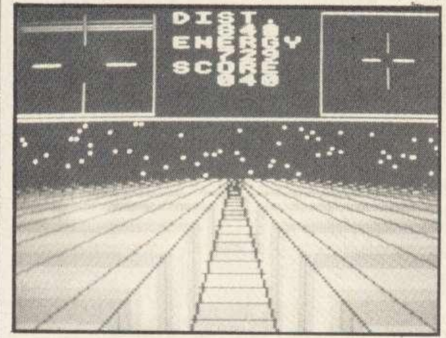
M R Cooper

TRENCH WARFARE

'Battle Planet', ISP Marketing, 15a Castons Yard, off New Road, Basingstoke, Hants, BBC B, £6.95

DONNING shoulder pads, dark glasses and skin-tight trousers you are yet again called upon to adopt the now familiar role of 'hero extraordinaire' to fly down the also now familiar trench to have one shot at the even more familiar ultimate in bad-guys! *Battle Planet* is a remake of the 'fly down a narrow hole while having goodness knows what shot at you' scenario.

Battle planets are about to KO mankind and you are volunteered to penetrate its one weakness (the trench). Avoiding odd robot fighters and trying



to stay one step ahead of the invincible robot commander are the seemingly impossible odds to be overcome before having a crack at the nasties. It's quite crucial that you destroy them, or you tend to expire.

To aid your quest, you have a force shield which, though using up your energy somewhat, will protect you from the robot fighters (who can also be zapped with the photon gun). Your secret weapon, however, is the plasma bolt launcher. You have three plasma bolts – one of which is used to destroy the 'battle planet' – which can stun the robot commander to give you a chance to escape.

The graphic effect of travelling down the tunnel is really quite effective, using a colour switching technique which needs a long set-up procedure. Animation is smooth, though not very complex, but I was impressed with the stimulating sound effects.

Packaging is colourful and informative, though no control layout is given in the inlay. The controls are, however, often given in the run of the program.

The one surprising feature of *Battle Planet* is that it is a Basic driven program with machine code routines for the more complicated parts. I discovered this when I pressed 'Escape' and – horror of horrors – it escaped! Quite amazing for a commercial game. The game's playable but nothing original apart from this aspect, so there is very little to recommend it.

Philip Tudor

TEE-TIME

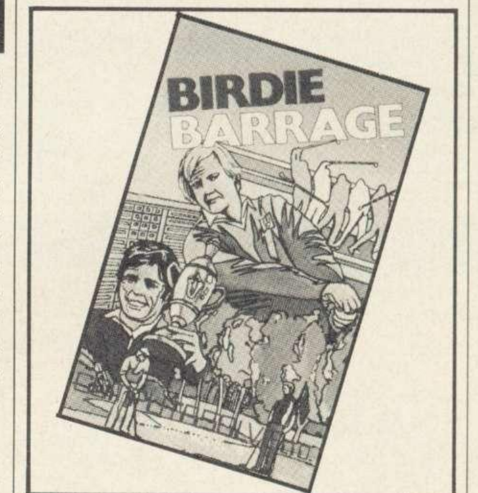
'Birdie barrage', Computasolve, BBC B and Electron, £7.95

IN this neatly packaged golf game, the idea is of course to hit a ball into a hole.

The title page tells you that the course is 72 par. Once loaded you are asked if you want music, and to check that caps lock is on. The predefined high score table is then displayed.

Pressing the space bar starts the game, producing an image of the first fairway. At each hole the red tee box has an arrow through it to show the wind direction and contains a yellow number giving wind-strength. At the bottom of the screen is a white box showing the distance and par of the hole being played. After entering your choice of club, a window displays the direction of shot, which can be rotated using the Z and X keys, and the strength, which can be altered by the up and down cursor keys.

Once set up you press Return and a white pixel pops out from the tee box representing the ball. As the ball slows down it can be carried by the wind. When it comes to rest it expands into a full stop, which is more easily seen.



You proceed like this until you reach the green, then the computer redraws the display as a green background with a black circle in the centre to show the hole, with a white circle representing the ball. You are told if it is a fast or slow green, then you set the parameters for your shot as before, except it is presumed that you chose a putter. And so you proceed through the 18 holes of Acorn Park Golf Course.

The screen displays are good and clear on a colour monitor but rather difficult on a monochrome display.

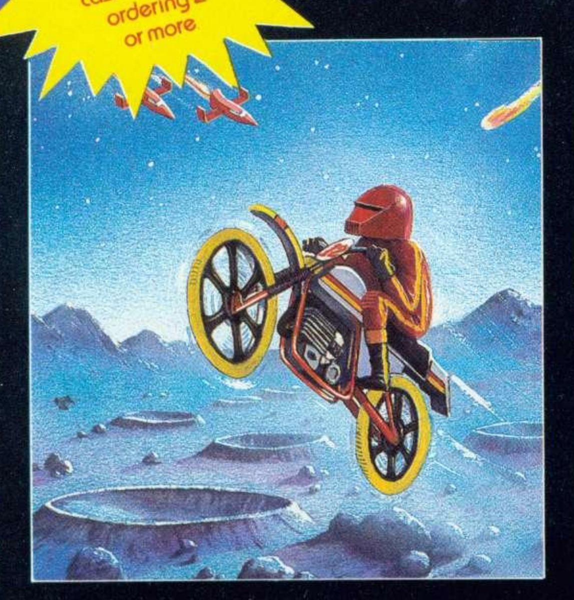
This is a fairly good game, though slightly lacking in excitement; its only fault is not having a constant display of your running score.

Roger Gammans

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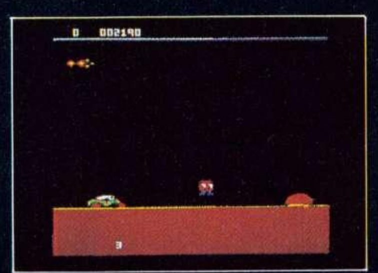














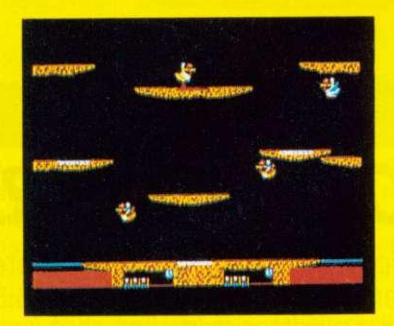
BMX ON THE MOON (32K) **£7.95**

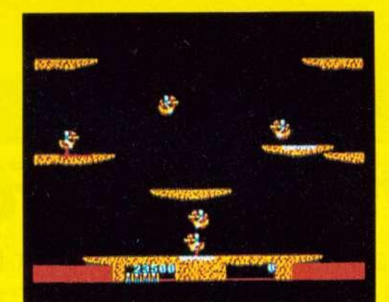
Smooth scrolling-screen arcade action. In this game you control a moon cycle which you use to patrol the surface of the moon. You must avoid the rocks on the surface, and also the monsters bouncing high in the low gravity. You should try to shoot down the spaceships which fly overhead dropping bombs onto the moon surface: A further hazard are the flying barrels which are often just too high to shoot or jump over, and just too low to squeeze underneath.

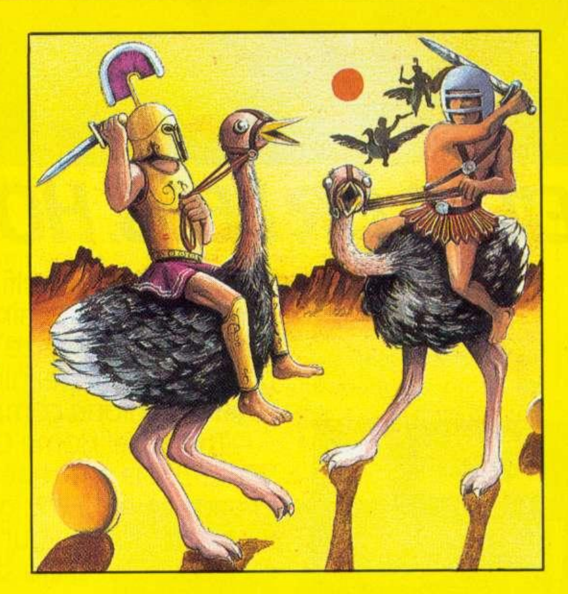
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A fascinating arcade-style game for one or two players. Each player rides an ostrich, and the aim is to knock the enemy riders off by colliding with them. In a collision the rider with the highest jousting pole will be victorious. If you are successful, the enemy will revert to its original form: an egg. The egg must be collided with to prevent it from hatching. Avoid the lava bath at the bottom of the screen, and remember: you can fly better by using stronger strokes – imagine you are an ostrich trying to fly!

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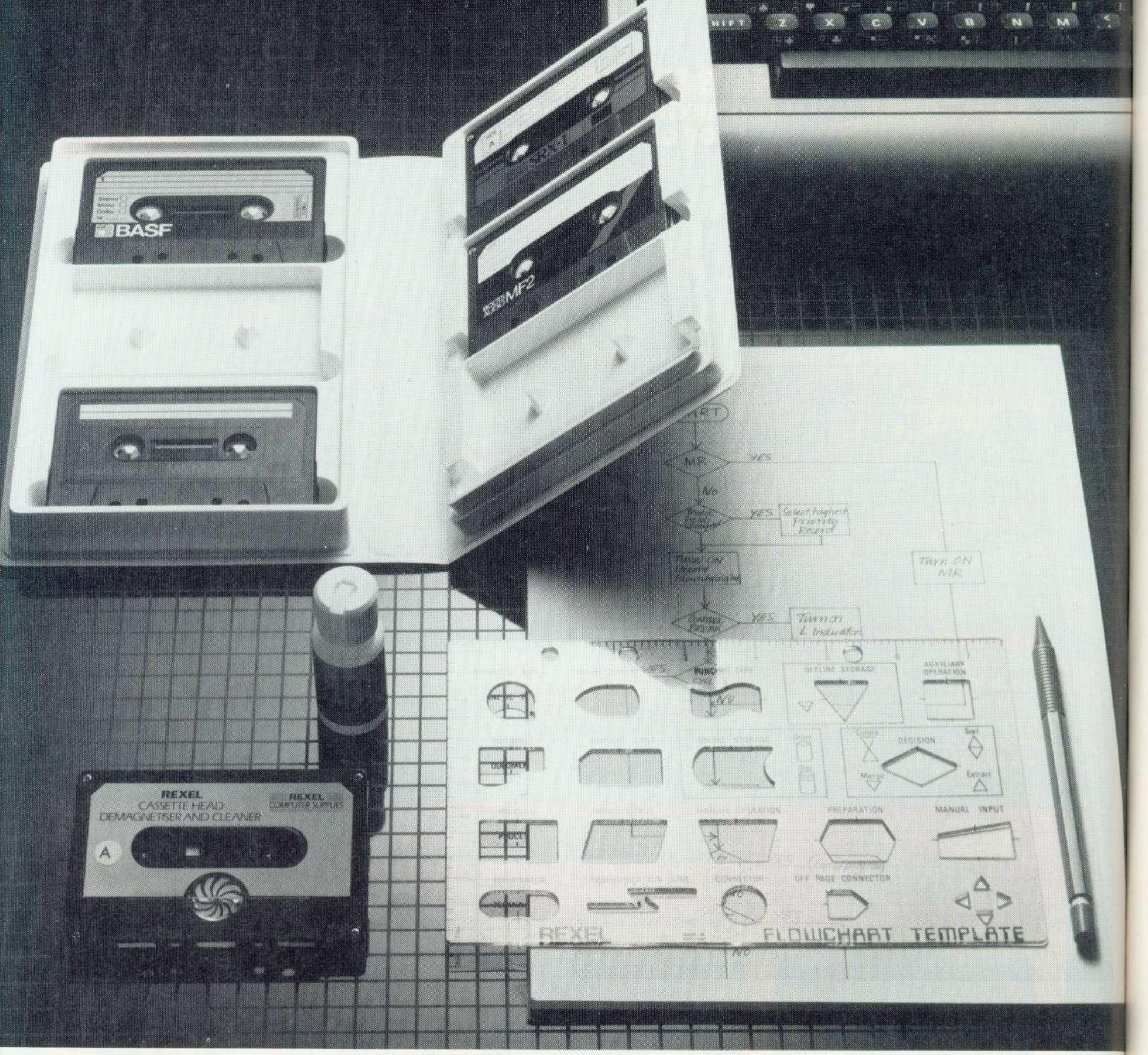
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'One Last Game', Clemoes Software, BBC and Electron (Plus-1 needed for joystick option), £6.95



A CROSS between *Space Invaders* and *Scramble*, *One Last Game* from Clemoes is unusual in allowing the joystick option on the Electron (with Plus-1) to be used with a cassette.

Once loaded a tune is played which I imagine sounds good on the Elk as it uses the cassette motor relay for the drum. There are six different types of aliens to fire, named Slimey, Rapier, Zit, Rammer, Invulno and Vogon. A list of these is shown when the game is loaded. At the bottom of the screen it tells you how to start and how to display the control keys.

To play you use A and Z to go up and down and Return to fire. As the one program runs both on the Beeb and the Elk you can increase the speed of the game with shift, which of course adds to the 20 different levels. When playing you face five rows of aliens to shoot at. Two or more aliens leave the rows depending on the level and come forward shooting, trying to kill you by running into you if you evade their fire. If you let them pass they will rejoin their ranks, so you can have another go at shooting them (stupid aliens!). If when the game finishes your score is high enough to get into the high score table you are given a rating: poor, average, etc. (I confess I haven't done better than average yet).

The 20 levels are lettered A to T and by entering the correct letter after space/fire/M you can start at any one. The ground alternates between buildings and hills as the levels change.

One Last Game operates on a mixed control format. Apart from the usual keyboard or joystick choice, a third option allows direction control from the joystick and fire from the keyboard. Although you can start with M or the space bar from the keyboard, if when you've first loaded it M followed by A is used to start the game, it appears to default to the joystick control for directions of your ship, although you still seem to be able to fire with Return.

The graphics on this game are of reasonable quality and well laid out.

I found this an interesting game with the excitement of a lot of the oldies such as *Space Invaders* and *Pacman*.

Roger Gammans

AVOIDING THE ALBATROSS

'Blockbuster', Micro Power, BBC, £7.95 (disc £9.95)

MICRO POWER has acquired quite a reputation for producing high-quality versions of existing arcade games for the BBC micro. More recently it has started to release new software on disc



as well as cassette, and *Blockbuster* is available in both versions.

The game follows the format of *Q*Bert*, in which you jump a character around a structure of hexagonal columns, changing the colours of their tops as you go. In this version, your character is a large green rabbit, and trying to prevent him completing his task is an equally big blue fox. You can temporarily forestall his pursuit by luring him off the back of the blocks while elevating yourself to safety on one of the two multicoloured disks provided for the purpose.

Other characters occasionally crop up to cause you annoyance and most are fatal to the touch. A fat white gull, described in the cassette inlay as an albatross, floats to and fro overhead and drops the odd blob of 'noxious guano' – nice! The sound effects are fairly ordinary, but the rabbit produces a satisfying boing each time he hops.

My main grouse is the response to the control keys. This is so intermittent on the first level that it can take three or four depressions of the relevant key before any action occurs. This is frustrating at the best of times, but much more so when the fox is hot on your heels. I became so annoyed playing the game that I delved into the code to see if it was written in Basic. It doesn't appear to be, but its hard to see why there should be this trouble if the game is totally in m/c code. There aren't enough moving sprites to cause any problem.

As far as I'm concerned, I've played better versions of this game from listings published free in magazines, and wouldn't consider buying *Blockbuster* when there are so many more responsive programs available.

Simon Williams

MAYDAY MAYHEM

'Mayday', Clemoes Software, BBC, £6.95

MAYDAY is essentially a *Lunar Lander* type game, ie, your craft is launched from the mother ship and you must land on one of the two pads at the bottom of the screen.

The first odd thing I noticed about this game was that there didn't appear to be any gravitational pull, so there are only two speeds – fast (without thrust) and slow (with).

Once landed and stopped for a quick cuppa, you must take off again, avoiding aliens who drop bombs on your shuttle. I found getting down onto the pads easy, and the asteroids weren't too bad, but getting back to the mother ship was quite a challenge.

To make the game more interesting and addictive there are several different colourful screens and graphics are good, if a little flickery.

I found one bug: when the explosion of your ship takes place, bits fly everywhere, yet the image of your craft remains at the bottom of the screen.

Mayday comes with a screen shot on the front of the inlay (this is left out on many games, and such an omission always makes me suspicious of the content), but it's not a game I'd rush out and buy.

Rob Fenton



GROWING PAINS

'Paranoid Pete', UBIK Software, BBC B, £7.95

AT first sight *Paranoid Pete* looks rather insignificant, packaged in a normal cassette case with a bright yellow inlay card, but it's an amusing, simple, addictive and original game.

Due to a worldwide shortage of wheat, Pete the space-farmer has taken his ship into orbit around the planet Owwayondah. He is beamed down onto the planet's surface, then at a random interval a hatch opens and a seed falls out. Pete must dig a hole for this to fall into, then bury it. Meanwhile, the Mega-wibblies are trying to have him for their breakfast!

Once sown, the wheat starts growing into a plant, which must be protected from the enemy, but luckily our paranoid friend can defend himself with a nifty bit of sword fighting with his trowel. The Mega-wibbly victim of such a spade-bashing instantly de-materialises.

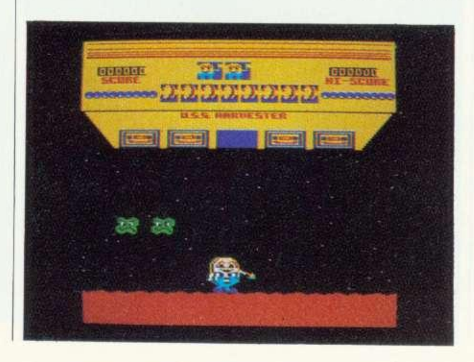
When Pete's plant is fully grown, the arm of the UBIK 'droid comes down and takes the wheat up into the ship to be processed, but the wibblies are at it again, so it's up into the Harvester to sort them out. There are only two screens on *Paranoid Pete*, but both are inventive and well drawn. In sheet two you actually see the plant being taken up and made into the finished product which must be protected.

When you've completed this, Pete is beamed back down with more wibblies and two plants to grow. After that, playing gets really hectic, but it can't deter you from hitting the space bar for another game!

The title page is good and the colours alternate while loading. Pete himself is dressed in a colourful suit, complete with scarf and braces, and the programmer has even taken the trouble to put a shine on his shoes.

Kids will love this game, and I would certainly add it to my collection.

Rob Fenton





NICE GAME – SHAME ABOUT THE SCENARIO

'Rubble Trouble', Micro Power, £7.95 (disc £9.95)

THE arcade game *Pengo* has spawned many imitations, most of which mimic its main features and do what they can with the graphics. *Rubble Trouble*, however, sets a new scene and offers one main feature to distinguish it from the rest.

For those who don't know the original game, the hero is set in a maze and is chased by a number of nasties, in this case two-headed mutant turtles called 'crackits'. His only protection is the ability to push the boulders which form the walls of the maze in the hope of squashing a crackit against a wall. The difference between *Rubble Trouble* and the other versions I have played is that the boulders bounce back if the crackit is missed and stand a good chance of turning you into so much paté.

This all adds to the excitement, but if you're still after something more, there are options to play with the screen full of blocks, thereby disguising the whereabouts of the maze walls, or with invisible walls, which is much the same but less colourful. Bonus points are scored for pushing special boulders and there are others which explode if pushed. The whole program is well-written and runs colourfully and smoothly. The sound effects and accompanying music are original and of a very high standard.

However, I have a strong reservation about this game. The 'alternative' scenario I mentioned earlier places you in post-holocaust Britain fighting radioactive mutants and your exposure time is limited before going down with radiation sickness. I find it hard to accept any light treatment of this subject and feel this storyline invidious in a 'jolly' game. Nice game – a shame about the scenario.

Simon Williams

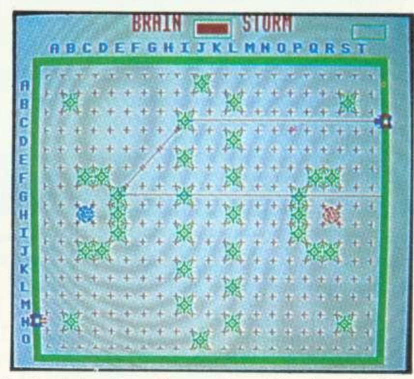
CEREBRAL CARNAGE

'Brainstorm', Virgin Games, £7.95

BRAINSTORM, a new release from Virgin Games, supposedly combines the tactics of chess with the carnage of *Defender*. It's for two players and the idea is to frazzle your opponent's brains by reflecting high-energy laser beams at him or her. This is done by depositing 'Electro-prisms' in relevant positions on the board shown on the screen. When you're positioning a prism you must also set the 'Deflection Factor' which determines the angle at which the laser beam will bounce off it. The player's laser is at one side and can be raised or lowered instead of laying a prism.

Before the game begins, the players must agree how awkward the screen will be. The time that the laser beam remains on can also be varied – the longer it's on, the more time your opponent has to plot against you!

Now for my criticisms, in particular the instructions. Though they are long, they are far from comprehensive. The basics of the game are hardly covered, whilst the trivia is given the fine tooth-comb treatment. Let's hope the life-



jacket instructions for Virgin Airlines weren't written by the same chap!

But on the plus side there is a screen picture in the cassette inlay (along with the life history of the author) which is a great idea so you know exactly what you'll get for your precious money! The screen display is nice and clear with good use of colour. Once you've figured out what to do, the input is quite logical. It loaded with no problems and there is a copy of the program on the 'flip side' of the tape (Virgin said that, not me!).

My verdict is that it's a good one for those who want to cut their teeth on something mild before going for full-blown alien zapping and at £7.95 it's not going to burn a hole in the proverbial pocket either!

Philip Tudor

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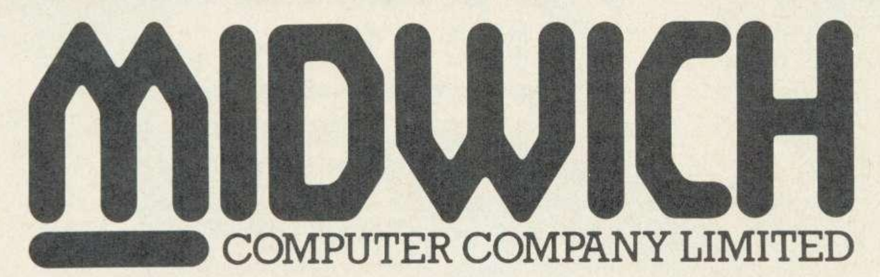
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GUIDING LIGHTS

Are you in the dark about lightpens?

In the first of a two-part series

Chris Drage compares four models

EVERYONE who purchases a micro is immediately aware that the standard device for inputting data into the system is the keyboard. The range of different input devices though, is quite considerable. They include joysticks, graphics pads/plotters, voice input systems, direct sensors, touch-pads and lightpens. The primary purpose of lightpens is for inputting two-dimensional visual data. In a way it reverses the usual flow of information in a computer system. Instead of using the monitor screen as an output to the user, the lightpen enables it to be used as an input device returning data to the computer.

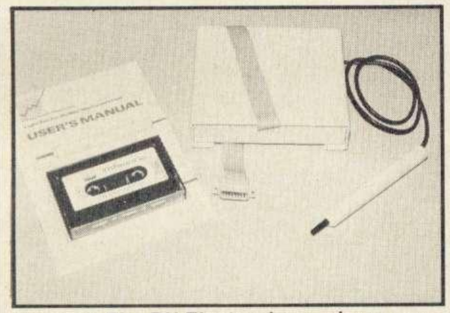


Figure 1. The RH Electronics package comprising lightpen, interface unit, introductory software and user's manual

Typically, a lightpen is a cylindrical object similar to a felt tip pen. From one end of the tubular body emerges a lead which connects the lightpen to the A/D socket on the computer. Housed in the tapered end of the lightpen is a light sensitive transistor, its sole purpose to sense lit screen pixels. Within the barrel of the pen is circuitry which organises and shapes the signals received by the light sensor.

Because the BBC micro has a 6845 cathode ray tube controller (CRTC chip) built into it, the lightpen is able to behave in a far more sophisticated manner than the norm for many computers. No longer a mere sensor of lit and unlit portions of the screen, the 6845 IC allows the lightpen to register the exact position at which it is pointing on the screen. This opens the way for a number of useful applications.

The four lightpens described here represent a range available for the BBC micro from the middle to the top end of the market. Unfortunately, few software houses supply versions of their packages that work with a lightpen. A peripheral such as this relies heavily upon support from its manufacturer, and the pens in this article were chosen because each manufacturer provides very good software support.

SUPPLIERS AND SPECIFICATIONS

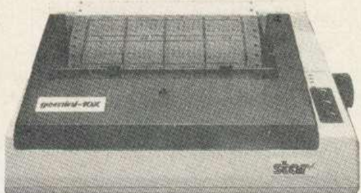
Product	Colour Light Pen
Manufacturer	RH Electronics
Interface box	Yes
Dimensions	Pen: 123mm x 15mm Interface box: 145 x 127 x 40mm
Switch type	Probe with microswitch + LED indicator
Cable length	Pen: 880mm Interface box: 420mm
Price	£45.95 inc VAT
Software supplied	Five utilities, two games, one sketch program
Review copy obtained from	RH Electronics (sales) Ltd, Chesterton Mill, Frenchs Road, Cambridge CB4 3NP

Product	Stack Light Pen
Manufacturer	Stack Computer Services
Interface box	Yes, complete with 15-way D plug
Dimensions	Pen: 135mm × 9mm Interface box: 65 × 45 × 18mm
Switch type	Touch contact rings
Cable length	900mm (working length)
Price	£28.00 inc VAT
Software supplied	Nine games plus Litewriter program
Review copy obtained from	Stack Computer Services, 290-298 Derby Road, Bootle, Merseyside L20 8LN

Product	Robin Educational Light Pen
Manufacturer	Educational Software Co
Interface box	None
Dimensions	130mm × 11mm
Switch type	Finger touch contact-rings
Cable length	900mm (working length)
Price	£41.40 inc VAT
Software supplied	'Paint Brush' program
Review copy obtained from	The Educational Software Co (Southport), 108 Parthenon Drive, Liverpool L11 7AQ

Product	Datapen Light Pen
Manufacturer	Datapen Microtechnology
Interface box	None
Dimensions	135 × 15 x 23mm
Switch type	Thumb switch plus LED lamp
Cable length	1050mm
Price	£25.00 inc VAT & pp
Software supplied	Two graphics programs
Review copy obtained from	Datapen Microtechnology, Kingsclere Road, Overton, Hampshire RG25 3JB

star ATTRACTIONS



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The RH Electronics Colour Light Pen is the only one actually approved by Acorn Computers for use with the BBC micro. It is rather different in characteristics from the other three pens. The RH Electronics package consists of a lightpen, an interface unit, introductory software and a substantial user's manual (figure 1).

The pen comprises a stout off-white aluminium tube with a black plastic probe at one end. At the other end a screw plug provides a solid anchorage for the screened cable and red status LED indicator. Inside is a neat and narrow printed circuit board containing circuitry that organises the signals. An extremely fine micro-switch allows the push tip to signal the user's decisions to the computer.

The pen is linked to the cream metal interface box by a screened cable. The interface circuitry controls the switch and video pulse latches. It is also responsible for converting the analogue video pulse into TTL levels. The computer sends bytes to the interface unit where they are stored. The various latches are then set for the different modes. The interface box is connected to the BBC micro via a 420mm ribbon cable and 15-way analogue connector. Each element in the system is well made and the overall impression is one of quality and robustness.

The software supplied with the lightpen comes on cassette and comprises a machine code driver routine, utilities and three demonstration programs in Basic: 'Draughts', 'Kwartet' and 'Draw'.

'Driver', 'LPDrive' and 'Reloc' are machine code loader and relocator programs plus the driver routine, which allow programmers to interface the pen with programs of their own devising. My only criticism is that the driver routine resides at &E00 and resets PAGE. Being protected, there is no easy way you can relocate it and thus not lose valuable memory. SETUP is a utility that enables adjustments to be made to the TV/monitor's brightness and contrast thus enabling the pen to detect video pulses correctly. The second utility TRIM, is included to enable the offset to be adjusted. This calculates and plots a point on the screen relative to the physical position of the pen probe. These utilities ensure that you are able to set up your RH Light Pen to its greatest accuracy.

The three demonstration programs are just that. As applications software they are very limited indeed but by listing each one and examining the lightpen related procedures a great deal can be learnt. I do feel however, that for £45.95 one piece of serious applications software should have been included to put the pen to some real work.

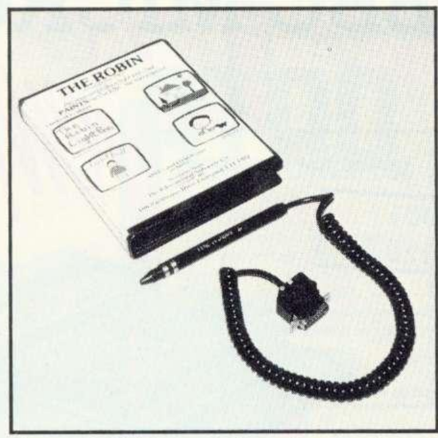


Figure 2. Lightpen, information cards and software cassette which make up the Robin Educational Light Pen package



Figure 3. The Robin lightpen and its 'Paint Brush' program allow children to get down to creative work without delay

Documentation in the form of a 20-page user's manual is excellent. Eight pages alone are devoted to using the procedures, and it is most helpful in the construction of lightpen software. Details are also given about the demonstration programs and there is plenty of technical information on how the pen works.

Without a doubt the RH Electronics Colour Light Pen is outstanding. It is extremely well-designed and constructed, pleasant to hold and very strong. I used the pen with groups of 10-year-olds over a period of three weeks during which it worked faultlessly. Its instantaneous response was a joy. The narrow probe tip was excellent, ensuring good visibility round the operating area. However, attention should be given to keeping a clean screen as classroom 'dirt' tended to clog the probe's fine aperture. The probe's optics concentrate and guide the light, enabling the pen to be used for very accurate work. Two features I particularly like are the positive push-tip method of switching and the bright, sensitive LED. They combine to give the user total control over the pen.

If you have £45.95 and require an instrument of the highest quality, with advanced control, sensitivity and accuracy then I wholeheartedly recommend the RH Electronics Colour Light Pen.

The Robin Educational Light Pen marketed by the Educational Software Co (Southport) is aimed directly at the educational market. This package com-

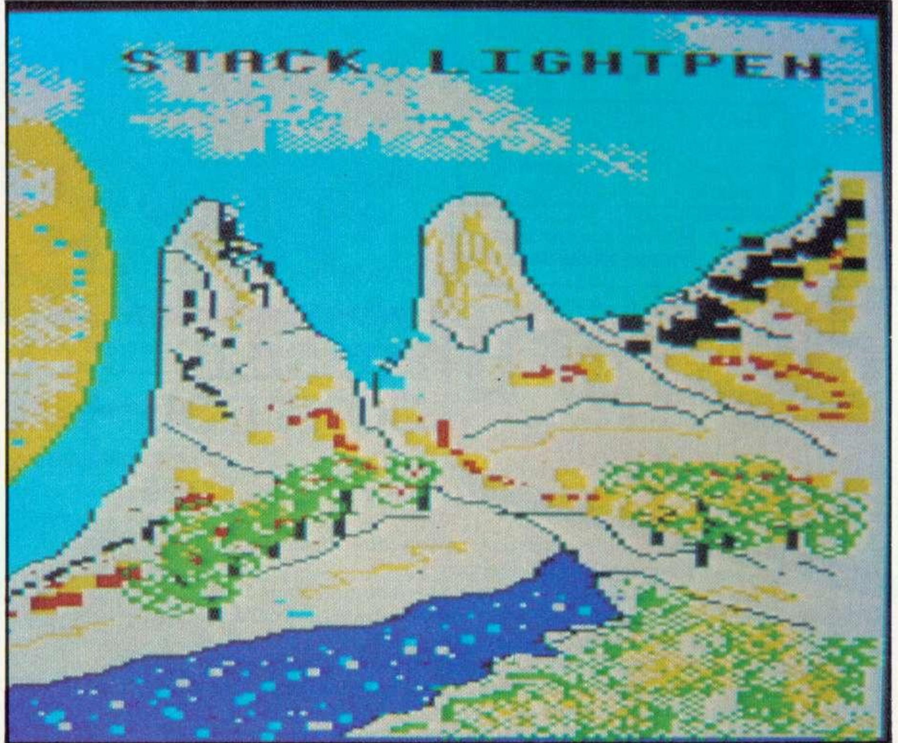


Figure 4. The Stack lightpen is aimed at the entertainment and games market, and has a facility for pictures to be saved and loaded

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prises the lightpen, information cards and a cassette software (figure 2). The pen is black and cased like a felt tip pen. The barrel has a detachable tip which enables the sensor to be placed closer to the screen to increase its sensitivity. The pen is connected to the Beeb's analogue port by way of a twisted, telephone-style cable which can be stretched to a suitable operational length. The lead terminates in a

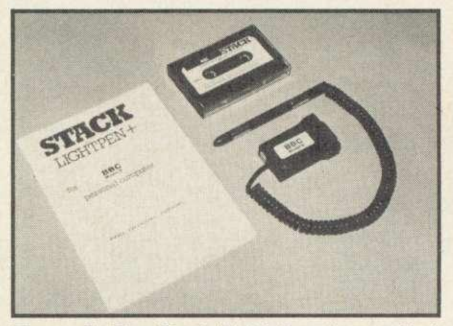


Figure 5. The Stack Light Pen is supplied with a preliminary manual and a cassette of games software

standard 15-way 'D' connector, and it's refreshing to have a classroom peripheral with a decent sized lead.

Internally, there are few surprises. The pen contains the photo sensor and the necessary amplification circuits that detect and amplify the current passing from the sensor and pass a suitable signal to the CRTC chip. Near the tip of the pen are two chrome rings which serve as a finger-touch switch that causes the pen to react or not to react to light. This provides the pen with a switching device. It operates in a manner similar to the fire button on a joystick, and in use proved a very reliable means of switching the pen. No adult or child found the method difficult to use mainly because the chrome rings are sited at just the right point on the pen barrel.

As the Robin pen is so strong, sturdy and simple to use, I decided this should be my class's introduction to the use of lightpens. It was a smash hit right away, due in no small part to the excellent 'Paint Brush' program that accompanies the pen. Comments like 'incredible, amazing ...' were soon superseded by gasps as the children came to realise that the screen had been transformed into a 'canvas' and they really were painting and drawing, only this time, with light.

It's a real treat to discover that a program as useful as 'Paint Brush' is included as part of the package. Its success is entirely due to its simplicity, enabling pupils (and teachers!) to get down to work creating vivid screen images almost immediately. A simple menu is presented down the left-hand side of a white (mode 2) screen. Seven colours plus a 'rub-out' (background) colour are offered. Each time you wish to create a new image you pick a colour, place the pen at the required position and touch the chrome contacts. By use of a command key BRUSH may be made to draw lines, triangles, rectangles and filled or unfilled circles of all sizes. Text can be input on the screen, and freehand drawing/painting is also supported. All these effects are possible using single letter commands with a bit of point fixing using the space bar. It is so simple that Joanna, using a lightpen for the very first time, created the park scene (figure 3).

Saving and Loading pictures is also possible by single key commands. Beware though if you are using discs, as each picture is saved under the same file name, thus over-writing existing picture files, as we learnt to our cost. Rubbing out is a natural form of deletion for young children, and with 'Paint Brush' they really appreciated the power of being able to create and rub out images at a stroke.

Disappointingly, the accompanying documentation is rather sparse. Just two small cards are provided, the first giving the operating instructions for the 'Paint Brush' program, the other a brief description of a pen routine to enable programmers to develop lightpen software for themselves. The 20-line pen routine listed is really only just enough to get started with. This excellent little package is really let down by lack of sufficient documentation.

'The Robin was a smash hit right away'

The Robin Educational Light Pen is a ruggedly constructed, yet sensitive pen ideal for classroom use. It appears overpriced at £36 plus VAT yet, as we shall see next month, with this lightpen you have a tool far more versatile than just an electronic paint brush. For teachers and parents who wish their charges to use a tool ideal for creating and discovering on-screen images, look no further than this.

Stack Computer Services has aimed its lightpen well and truly at the games/entertainment end of the market. The package comprises a lightpen, a preliminary manual and a comprehensive selection of games software on cassette (figure 5).

The lightpen has a long, thin black barrel, with two 20mm chrome bands situated at the top and bottom thirds along its length. The barrel houses a photo diode specially developed for Stack in Japan, and the circuitry that accomplishes various timing conversions and senses when the two touch contacts have been made. A twisted, telephone-type cable terminates in what looks to be a large, black plastic analogue 'D' connector. Its best working length is about one metre. The large 34-way connector houses a video speed comparator and amplifier which increases the intensity and shape of the signal so that it may be presented to the computer more effectively.

Perhaps the most obvious features of the Stack Light Pen are the touch contacts which allow the user to choose when the computer is to control the lightpen registers. Without this the pen could 'see' the screen each time it is approached thus making it very awkward to control. In practice however, the touch contacts proved rather difficult to master, as the pen must be held further back along the barrel than an ordinary one. With the upper contact cradled between the thumb and forefinger, another finger must be extended to touch the lower contact, so often contact was made inadvertently because the fingers slip towards the pen tip. The touch sensitivity, however, is very good.

Accompanying the package are nine games and a graphics program on cassette. Most are rather sedate versions of popular games converted for use with the lightpen, including *Othello, Shuffler, Simon, Go, Draughts, Seek & Destroy, Crossword Twister, Life* and *Labyrinth.* The most interesting by far is

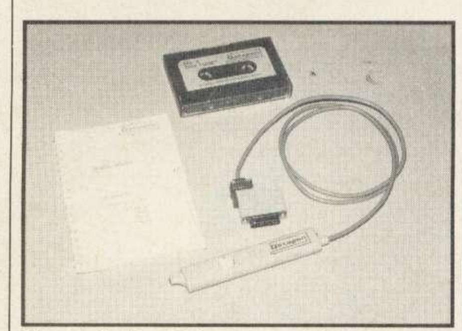
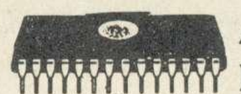


Figure 6. The Datapen, oval in cross-section, comes in a package with software on cassette, 15-page handbook, printed listing sheet and two rubber probe inserts

'Litewriter', a versatile little program including some very good features. Written in mode 2 using eight colours (white is the background and erase colour), it is entirely menu driven. Both a colours menu and a brush menu are provided, the latter giving eight different brush strokes. Lines, rectangles, circles, text input and freehand drawing are all supported. A simple fill routine is also included. Pictures may be saved and loaded (figure 4). The code



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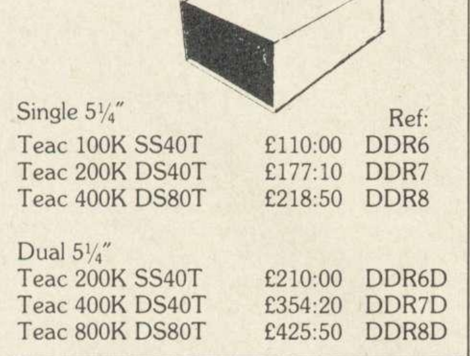


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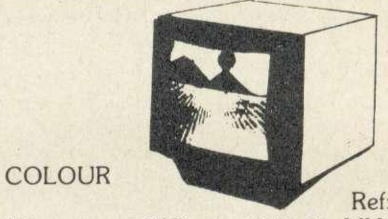
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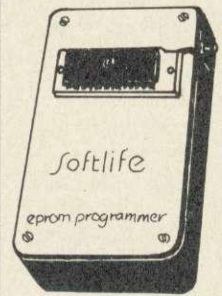
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is written in a structured way and Stack invites you to experiment with it.

Documentation comprises a seven-page duplicated stapled booklet marked *Preliminary Manual*. Although it appears to be hastily put together it is quite good. The introduction discusses raster scans and pixel character construction. It explains how a lightpen sees the screen, and a section on the state of the registers and how to set up a lightpen for individual TVs/monitors is most useful. The manual includes an 18-line program to type in, intended to illustrate how the lightpen routines work so programmers can include them in their own programs. There is not quite enough guidance given and beginners would benefit from more detail on how to implement the routines. Hopefully, Stack will have extended this section by the time the full manual is published.

For the games enthusiast, the Stack Light Pen at £28 represents value for money. The company seems keen to back up its product by publishing further lightpen-oriented games software. However, for the dedicated arcade fiend the Stack Light Rifle at £29 must be number one on the list. Shooting 'em down a full two metres from the screen really has to be experienced! By comparison keyboard based shoot-'em-and-zap-'em games seem sedate indeed.

The Datapen from Datapen Microtechnology is physically different in design from the other pens reviewed. This package includes a Datapen, software on cassette, a small 15-page handbook, printed listing sheet and a packet of two rubber probe inserts (figure 6).

The pen is oval in cross-section with an offset probe at one end which houses the light sensor and a large status indicator LED and cable at the other. The screened cable terminates at a standard 15-way, 'D' connector at the BBC end. A very good working length of cable is provided. The Datapen is provided with a thumb switch on its left-hand side towards the probe end of the barrel. The switch allows the user to control when the computer is to read the lightpen registers of the CRTC chip. Like the Robin pen, it functions as a joystick fire button. The body of the pen contains circuitry to amplify the signal from the sensor, passing it through a highpass filter to give good reaction to local lighting conditions. The resulting signal provides a fast positive strobe for the video interface chips.

At first I thought the Datapen was for right-handed people only, but by inverting it so that the thumb switch is on the right, left-handed operation proved no problem. The rubber probe insert did help the performance on a standard resolution monitor but had to be removed for use on a high resolution Kaga monitor as it cut down the amount of light reaching the phototransistor. I found the LED's output rather disappointing compared with the RH Electronics pen but the Datapen's overall performance was good.

The software provided on cassette, includes three programs: 'Intro', 'Sketch' and 'Shape'. The former program is a very good interactive demonstration of how the Datapen works. 'Sketch' is a mode 4, line-drawing program with save and load facilities. 'Shape' is a very good character definer program: using the Datapen to fill an 8 × 8 grid, characters may be defined and saved, their VDU23 parameters being noted from the screen. The programs are accessible and much can be learnt from listing them.

The accompanying documentation discusses how lightpens work, followed by a brief circuit description and how the switch and the X & Y positions of the pen are read. Unfortunately, much of the booklet is taken up with information relating to the CBM 64, Vic and Dragon computers, but there is sufficient help when read in conjunction with the 'Intro' program. A separate sheet describes the 'Sketch' and 'Shape' programs and lists three useful procedures to include in your own software.

This is a good lightpen at the right price. It aims at a wide market and can be especially recommended for beginners who wish to 'shine a light'.

Choosing a lightpen depends very much on personal circumstances. Each pen reviewed here is well-constructed, has worked satisfactorily over a period of time and comes with routines to enable you to write or adapt your own programs for lightpen use. But how many people are prepared to burn the candle at both ends converting their software? Not too many I suspect, and it is highly unlikely that schools will embark on such a time consuming activity.

If people are to make the most of their lightpens then they need a supply of quality applications software. RH Electronics, the Educational Software Co, Datapen Microtechnology and Stack each provides substantial software support for their products and in some cases enable the user to do something really worthwhile with their new acquisition, which is an important consideration when choosing your lightpen.

HOW THEY SCORE

	RH COLOUR LIGHT PEN	ROBIN EDUCATIONAL	STACK LIGHT PEN	DATAPEN
Design	5	4	3	4
Construction	5	5	4	4
Switching	5	4	2	4
Cable length	4	4	4	4
Handling characteristics	5	4	3	4
Ease of use	5	5	2	4
Software provided	3	4	4	4
Documentation	5	2	3	4
Insensitivity to ambient light	5	5	5	5
Colour monitors* it works best on	All types	All types †	Standard medium res.	Standard medium res.
Range of applications	Wide range	Education, home use	Games, home use	Education, home use

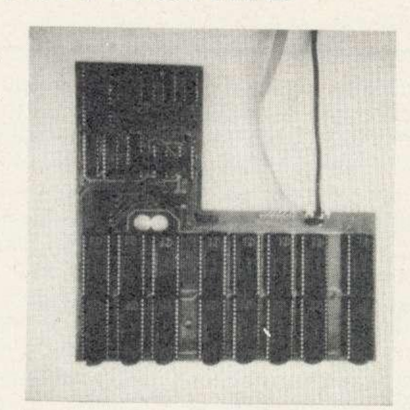
** Monitors used in this review were: Microvitec (standard), Novex (medium), Kaga Vision III (high).*

† Works well with hi-res, when tip removed.

KEY: *5 EXCELLENT, 4 GOOD, 3 SATISFACTORY, 2 POOR, 1 VERY BAD*

Next month in part two, Chris Drage tests the software available to support the lightpens.

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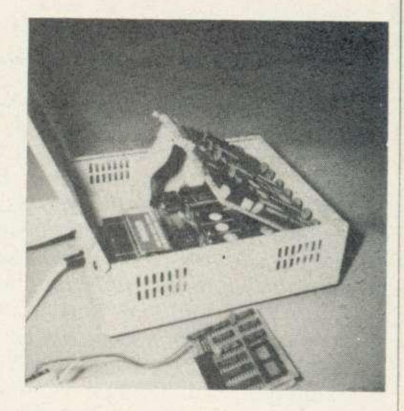
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The second board can be selected as an alternative to the first board, either by a switch on the case *or* via software control.

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2. No access into machine required after initial fitting.
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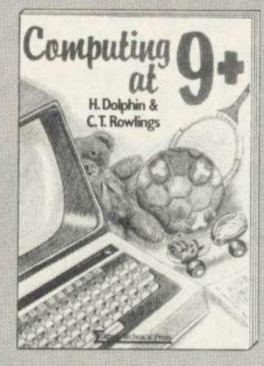
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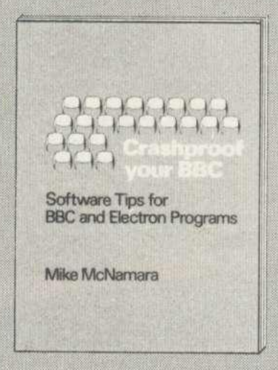
What you should look out for on the BBC ... and Electron



Computing at 9 Plus
H. Dolphin and C.T. Rowlings

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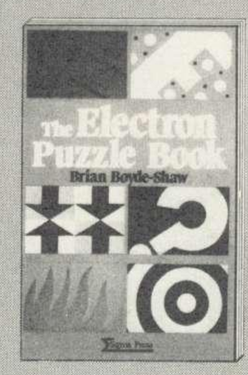
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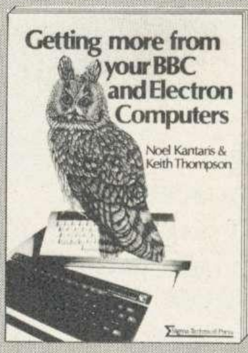
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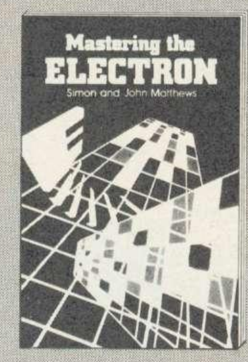
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Techniques to stretch you

'Advanced Electron machine code techniques', A P and D J Stephenson, Granada Publishing, 208 pages, £6.95



FOUR of the chapters in this book deal with techniques, the remaining four cover background topics such as the 6502 instruction set, the hardware and the resident assembler. Techniques discussed include: multi-byte loops, sort routines, subroutines, macros, look-up tables and graphics and interrupt handling. While these techniques are quite advanced the book is aimed more at the early enthusiast, and also contains basic information.

It's written in a clear and easy to read style, the authors steering that difficult course between long words and convoluted explanations and three-letter words and cartoons.

My main criticism is that while addition and subtraction (of integers) get a good airing, multiplication and division are hardly mentioned. It could be argued that a work covering advanced techniques should not include such mundane items, but then why do such basics as the 6502 instruction set get a 25-page chapter and a 14-page appendix?

The chapter on interrupts is a little confusing and, for owners of the standard Electron, largely redundant, since it deals mainly with the 6522 user VIA which the Electron does not possess. The brief section in this chapter devoted to interrupts is spoiled by the omission of the interrupt-handling routine from the only example program.

I do not want to give the impression that I didn't like the book, on the contrary, I enjoyed reading it very much. It's one of the few books which has a comprehensible and interesting description of the hardware, plus an explanation of the speed difference between the Electron and the BBC, which use the same processor but different memory configurations.

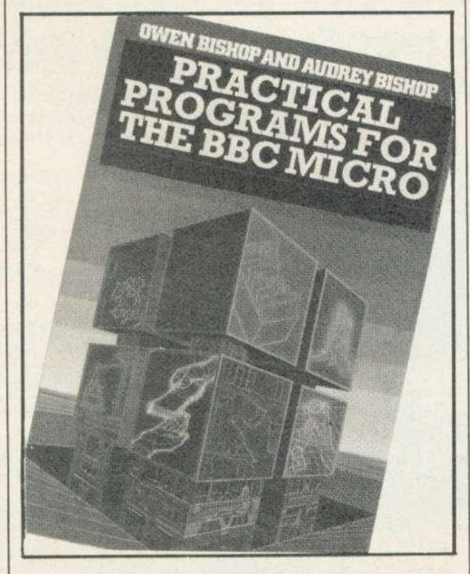
However, the description of the 6522 VIA's registers – which seems almost compulsory these days – left me glassy-eyed as usual. I'm sure that setting low order latches is crucial stuff but I'm still waiting to find out why. Am I alone? Regurgitated data sheets from chip manufacturers do not make good educational material. It would be helpful if we were given a bit more information on the why rather than the what.

A useful and instructive book for people who are just past the beginner stage and want to stretch their wings.

Harry Sinclair

Where's the structure?

'Practical Programs for the BBC micro', Owen and Audrey Bishop, Granada Publishing, 172 pages, £6.95



ROY Atherton wouldn't like this, in fact his whole body would probably turn a funny colour. If you are a structured programming freak this book is not for you. It's unwise to criticise the programming style of others – let he who is without sin, etc – but there is so much in this book to make the eyeballs bulge that I can't resist.

It appears the authors have gone out of their way to irritate structure fans. I can only suggest that the programs were written on a machine running a rather crude dialect of Basic and then modified to run on the BBC. Structuring them would have meant totally rewriting them. For instance, how would you like to sort out control in this sequence?

```
1090 IF L > NN THEN 820
1100 GOTO 750
1110 CLS:PRINT''CHR$ (134)
"FINISHING"
1120 GOTO 230
```

Another pointer to a non-BBC Basic being used is the fact that ELSE is never used – quite remarkable in a series of programs which test so many conditions.

It's also a shame, since the program ideas are quite interesting. There are 14 of them including accounts, stock control, trend analysis, a spreadsheet, and one to compare two data series using the impressive sounding Wald-Wolfowitz technique.

There is a brief introduction to each program, notes on using it, keying-in tips, a short section on its design, the listing and suggestions for modifications.

The book is nicely laid out and well written. I just wish the authors had taken the trouble to restructure the programs for the BBC.

Harry Sinclair

Practical guide to Pascal

'Pascal for Basic programmers', Charles Seiter and Robert Weis, Addison-Wesley Publishers, £9.95.

BOTH Basic and Pascal are computer languages that have been adapted well to microcomputers. Although similar in many ways, there are marked differences, strengths and weaknesses. No doubt an extended, structured Basic is the right language for beginners on microcomputers. (Do I hear cries of dismay from the structuralists?) It is ideal for small computers with limited memory capacity since it can provide immediate response to program changes, which is useful for the novice programmer. Pascal, however, offers increased sophistication and power to everyday programming.

The book is totally orientated towards the micro owner who is familiar with Basic and who wants to investigate the power, structure and convenience of Pascal.

It is in five parts: first, a chapter that will allow 'hands-on experience' with a suitable micro right away, with a subset of Pascal; second, there's a simple discussion of the process of translating high-level languages into machine code (including the influence on the varieties of Pascal); third, a section on

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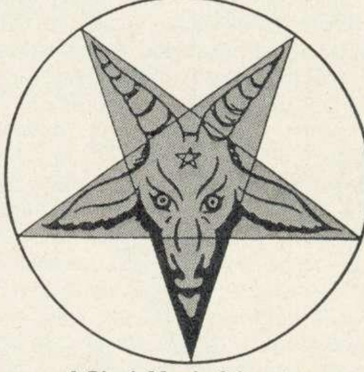
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Available fonts are:

***Accents**	Accents and miscellaneous.
***Block**	Small capitals.
***Data**	Like the bottoms of cheques.
***Greek**	It's all Greek to me too!
***Joined**	Standard capitals with joined up lower case.
***Maths**	A mix of until now unobtainable Mathematical symbols.
***Miscellaneous**	A few oddities which often are very necessary.
***Thick**	Thick text (for MODEs 0&3) to enhance 80 column mode.
***Thin**	Thin text (for MODEs 2&5) which makes modes 2 & 5 much more readable or perhaps "READABLE".
***Vertical**	For labelling graphs in a vertical plane.
***Mode 8**	10 column multi colour, memory miserly mode.
***S Dump**	A Dump facility which will produce a screen dump of any mode from 0 to 8 (including a text only dump in mode 7) on an epson, star, CP80, MT80 or JP80 etc etc. . . .

The dump utility will produce negative or positive product, can magnify, and will also rotate the picture through 90 degrees as well as being able to position the picture anywhere laterally across the paper.

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VI.4 STARSTICK was 4K the new version has been squashed into 8K.

The NEW ISSUE ROM is compatible with latest* ACORNSOFT programs as well as REPLICA II.

As with the VI41 issue of ROM you can at last connect good "self centring", "rapid action" joysticks to the BBC Computer via the user port. (Model A owners please note that you do not need the analogue interface fitted to your computer but you will need the user port and IC76).

Pressing any combination of the BREAK key does not affect the STARSTICK software and now by pressing TAB-BREAK REPLICA II is auto booted and is compatible with the STARSTICK ROM V2+.

The software patch provided in the ROM monitors O.S. calls and patches the Joystick to the Games programs, and so will work with most games programs even programs not meant to function with Joysticks (except those using illegal direct memory addressing).

The new command summary and description is + –

*STICK	enables the ROM.
*NSTICK	disables the ROM.
*SETSTICK	program joystick.
*KSAVE	save protocols set by *SETSTICK.
*KLOAD	load protocols saved by *KSAVE.
*MAP	remap current keyboard definitions, play games using your favourite keys.
*CLEVER	intelligent loading of software (ensuring ACORN compatibility).
*PLONK	relocate area of work memory used.
*PROP1	proportional joystick emmulator 1.
*PROP2	proportional joystick emmulator 2
*ANA	patches joysticks via the analogue port.
	to games.
*KILL	ROM manager, disables troublesome ROMs.
*DOUBLE	replace up to two joysticks.
TAB-BREAK	Auto boots REPLICA II.
*PAUSE	define key to freeze game.
*NPAUSE	dissable *PAUSE.
*NAME	predefined key protocols.
*HELP KEYS	display current key protocols.
*REPEAT	enables ROM based auto repeat.
*NREPEAT	dissables *REPEAT.

Should a contention state occur when two roms or more try to use the same *command prefixing any of the above with M will help solve the problem.

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Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE

All MICROTEST ROMs are fully TUBE ® compatible. (TUBE ® is a reg. trademark of Acorn Computers).

the practical aspects of programming; then a description of the process of planning and writing a Pascal program (two helpful illustrative programs are included); and lastly the book contains a very useful Basic-to-Pascal 'phrase book'.

The book compares Microsoft Basic and UCSD Pascal, both of which the authors claim are 'the most popular forms for microcomputers'.

The first chapter gets the reader to grips with Pascal without throwing him or her into the deep end. By focusing on the manner in which the simplest programs are organised, the different approaches of the two languages to control statements are emphasised. At a very simple level Pascal seems more cumbersome and wordy than Basic, but the authors reveal the virtues of Pascal in the later chapters.

This introductory chapter is a real gem. It provides that most essential element for a newcomer, immediate understanding and success. After an evening typing in the simple examples given, I had a clear idea of how Pascal is organised. The text is so clear I found myself well motivated to read on to discover the various control statements, syntax and structure of the language. The authors have cleverly devised this initial taster for 'dabbling-in-the-language', analogous to learning a few travellers' phrases in a foreign language before beginning a really serious study. Also it sets the theme for the whole work, that of moving from what is familiar (programming in Basic), to what is unknown and new.

With the aid of so many concrete examples, transferring to Pascal is far easier than I first anticipated, and I began to accept that Pascal has many advantages over Microsoft Basic. As the book points out, it is superior for longer programs as it can organise them into semi-independent pieces. It doesn't merely encourage the programmer to write in a structured way, it makes him! The advantages are obvious – readability and easy debugging of all programs.

The authors are quick to point out the speed at which Pascal programs run compared to their Basic counterparts but add that such a comparison is irrelevant. On a micro, machine time is free and programmer time precious. The real virtue of Pascal is that the organisation it forces on a program reduces program development time, making it possible for the micro-user to accomplish something in the limited time available. (Dare they imply that people don't enjoy spending hours debugging Basic programs?)

When Niklaus Wirth drew up the specification for Pascal he knew it would enhance its value to make it available for a number of different computers. Seiter and Weis give a detailed explanation of how high-level languages are either interpreted or compiled into machine code, and present a convincing argument for UCSD Pascal. Because it adopts an intermediate approach, no matter how microprocessors develop in the future, UCSD Pascal will be in a uniquely strong position for universal implementation (possibly the standard for computer literacy in the 1980s-90s).

This is an opinion to which I wholeheartedly subscribe. The extended 'structured' Basics (such as BBC Basic) can at best offer only limited structural features. They are essentially machine-tied and non-portable.

Much of the rest of the book explains in detail each aspect of the language, from simple assignment statements through to procedure nesting. At each level copious examples are given to illustrate or extend points made in the text, emphasis being progressively shifted from Basic in the early stages to entirely Pascal in the latter.

The final section of *Pascal for Basic programmers* compares MBasic (version 5.2) with UCSD Pascal (version 2.0). This section is essentially a dictionary which enables programmers to access quickly the operation they require (in Basic) and find the equivalent operation in Pascal.

Frankly, it is difficult to fault *Pascal for Basic programmers*. Seiter and Weis have a considerable understanding of the learning process, and the text is characterised by its clarity and considered approach.

For any serious programmer wanting to take advantage of the discipline of Pascal this book is an important step to successful applications programs. Rather than simply translating Basic statements into Pascal it stresses the process of programming in Pascal and thereby shows the reader how to take full advantage of its power and adds up to a practical, informative guide to learning to use that power.

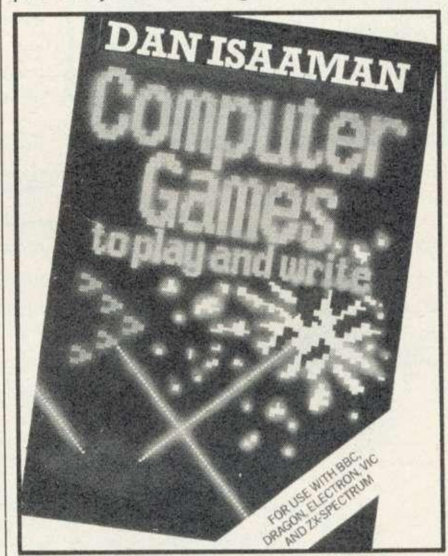
Chris Drage

Encouraging stocking-filler

'Computer Games to Play and Write', Dan Isaaman, Sparrow Books, 126 pages, £1.50

A PROLIFIC writer of computer software and a student at Manchester University, Dan Isaaman has a number of publications to his credit. This book is an excellent introduction to computer programming for the beginner, written in a simple style. The instructions are clear and will be understood by anyone interested in computing but with little experience.

Essentially, the book is a listing of 18 games of increasing complexity and intriguing titles such as *Red Alert, Spy Codes, NIM* and *Silo Raid*. They are written so that there are only minor differences in coding between a number of popular home computers, including the Beeb and Electron, which means that Isaaman has not taken advantage of the Beeb's more advanced features such as procedures and sound, but for his inexperienced audience this is probably an advantage.



The author is to be congratulated on his very clear descriptions of the programs and their working. The listings are bug-free and fully documented, and in most cases he includes a section on how the programmer might simplify or complicate the game. This is the book's value – its not just a listing of games. It could well provide the novice with the necessary encouragement to move from using the computer simply as a toy to writing his own programs.

In a section aimed at helping the reader to do this a storyline is suggested together with a program plan. This is followed by a skeleton listing of the code necessary plus clear explanations and encouragement.

In addition, a number of the full listings provided work satisfactorily and contain good ideas for games. These could act as the basis for more interesting programs by adding graphics, colour and sound.

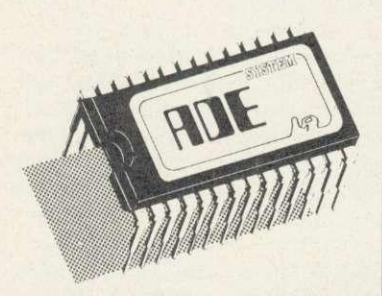
The book is concluded with a section on Basic and a glossary of terms.

Altogether an excellent and reasonably priced book, and a useful stocking-filler for parents thinking of buying their child a computer for Christmas.

Gordon Anderson

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The EDITOR is designed with the programmer in mind for writing both programs and documentation. The editor includes a very powerful command language (including macros) that enables much editing to be done on a semi-automatic basis. It features full screen editing and deferred edit modes; no limit to document size; edit with backup facilities and a versatile text formatter.

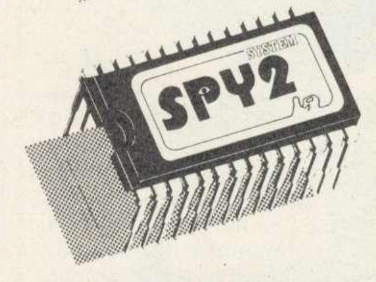
The DEBUGGER is instantly accessible for inspecting, modifying and disassembling machine code programs. Features include full 64 byte display in hex, ASCII and disassembled format; registers; stack; single step; breakpoints; memory search and much more.

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SPY2 includes a set of powerful disc recovery commands for interrogating, editing and retrieving data stored on a floppy disc. SPY2 also includes a disc formatter as well as a non-destructive single track reformatter.

In all SPY2 has a comprehensive set of 23 utility commands. These are supported by an excellent Reference Manual.

The SPY2 front panel encompasses all the superb, easy-to-use facilities of the renowned SPY debugging monitor PLUS additional commands for toggling and finding breakpoints; relocating machine code programs; single stepping through subroutines in one go and facilities for accessing the front panel from programs in RAM or ROM with breakpoints, OSBYTE or CTR-F.

SPY2 features a versatile disassembler with hex dump, full and intelligent disassembly. This identifies data areas in the program; these being displayed as a hex/ASCII dump. Operating system calls are labelled creating very readable code. The powerful trace facilities enable program instructions and register contents to be traced to printer whilst the program is running. Indispensable for graphics programs as they can be stepped through whilst observing the effects on the screen.

SPY2 features a disc sector editor displaying the contents of a whole sector; disc search facilities for finding byte patterns or strings and free disc space. Files may be recovered by creating a directory entry with all the data concerning the deleted file. Directory entries can be easily amended using the *AMEND command. The *FORMAT command formats discs with any number of tracks. A verify command checks discs. The *REFORMAT command is extremely useful for recovering information from a bad track, reformatting it and restoring the data. Commands are included for loading files at &1900 and automatically downloading (and running) them.

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Kmon – A curate's egg?

Kmon assembler/monitor, Kansas City Systems, Unit 3, Sutton Springs Wood, Chesterfield, £34

ACCORDING to the Kansas catalogue, Philip Gibbs, the author of *Kmon*, was asked to examine all the existing assembler/monitors for the Beeb and improve upon them, adding any feature he thought useful. Something of a tall order, so how did he get on?

One of the biggest failures of the existing products, he believed, was the way they 'felt' to the user. *Kmon* makes extensive use of colour coding of input and screen messages in mode 7, and this certainly means it's easy to see what's going on. Assembler listings have all relevant MOS labels (such as OSBYTE, OSWRCH) inserted automatically when the relevant address is called, and this goes for user defined labels too. The scroll speed of hex dumps may be adjusted, as well as being halted using CTRL/SHIFT. These features are very easy to get used to and make use of, but it's a pity after all this thought that there are a couple of niggles. For instance, all input is assumed to be decimal unless preceded by a '&'. Surely everyone who regularly uses a monitor/debugger would prefer a default to hex.

However user-friendly a product may be, it is of little use if it doesn't contain the right features. *Kmon* is a bit curate's eggish in this. Its assembler facilities are excellent, offering a single and double-pass assembler, producing a well documented listing and providing pseudo-ops ORG, MEM, DFB, DFW, DFS, SPC and REM. Most of these are implemented in the Basic II assembler, but are rather more self-explanatory under their *Kmon* names. Assembled code may be relocated using a built-in routine and then saved and run, again from within the system. A disassembly is easily arranged and the source is also easy to list and edit from the keyboard.

'Kmon is friendlier than most . . . but lacks some of the monitor facilities normally expected'

When it comes to the monitor, although everything is there, some of it is a bit awkward to use. The only time a 'front panel' display shows up, for example, is when running a program which comes across a BRK instruction. If it is then necessary to feed something into one of the CPU's registers, this may only be done indirectly by loading zero-page addresses assigned for the purpose. There is no way of single-stepping a program, although up to ten breakpoints may be inserted at different points in the code. Individual memory locations may be directly accessed and if a two byte value is entered, this is automatically up-ended into the low-byte, high-byte format used by the 6502. It would, however, have been easier to use if it were combined with the hex-dump, thus allowing the user to romp about in memory altering bytes as required (several similar programs offer this). Blocks of memory may be filled or moved, and single or two byte words may be searched for. All commands are single letters, some followed by the required parameters.

Overall *Kmon* is friendlier than most, and worth considering in the same light as Exmon, ADE and others, but lacks some of the monitor facilities normally expected. With a few fairly minor amendments, it could be the best of the bunch.

Simon Williams

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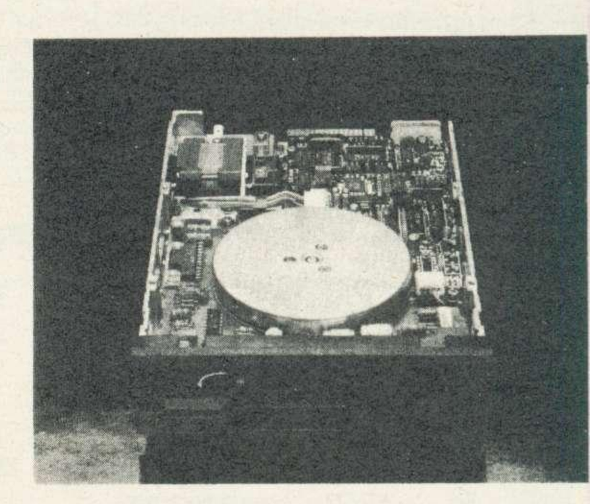
SOLIDISK HAS SOMETHING TO OFFER.

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The disk drive (see pictures) comes from the new series VLSI ultra quiet, auto spin-up, 5.25" half height, solenoid head load, 40/80 track, single and double density MITSUBISHI M4853. It is fast, quiet and consumes far less power than any previous models. 2 new 64 pin surface mounted microcontrollers (from Motorola and Mitsubishi), largely reduce the area occupied by the drive electronics (see pictures), leaving so much more room for the diskette, with very low noise level and reduced friction of the media and the jacket.



SOLIDISK DUAL DENSITY DISK FILING SYSTEM.

Basic characteristics include very high operating speed, Acorn compatibility, automatic 40/80 track switching, auto-density, resident disk formatter and 100% compatibility with Solidisk Sideways RAM.
It is also the simplest ever Disk Upgrade for the BBC computer: with only 4 components: 1 ROM, 2 buffers and the FDC. (See picture 3).

Solidisk software engineers have built in to the 8192 bytes of the 1.40 ROM more facilities than any other DDFS manufacturer has managed before.
The result is a substantial cost reduction, which is passed on to you.
Solidisk engineers won't stop there.
But let's first answer some more immediate questions.

1 — SINGLE OR DOUBLE DENSITY?

You get 60% more storage in double density mode than in single density mode at no extra cost.

In single density — the usual Acorn disk format — you get 10 sectors or 2.5 k bytes of storage per track. That is what the Acorn DFS and many others can do.
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In double density, you get 16 sectors or 4k bytes per tracks, an increase of 60%.
With the same TEAC 55A disk drive, you get 160k instead of 100k or with the disk drive in this offer, you get 640k bytes instead of 400k.



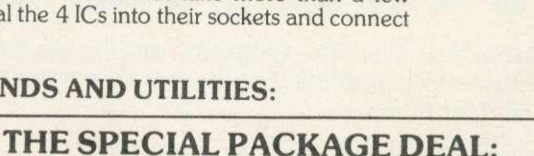
The majority of software tested also runs FASTER in double density mode than in single density mode, especially Wordwise, View, Masterfile and Scribe and 95% + of games are also compatible with double density.

2 — INSTALLATION:

As the STL DFS consists of only 4 ICs, to be plugged into existing sockets on the BBC computer board, installation is quite simple and should not take more than a few minutes even if you are a novice. Simply instal the 4 ICs into their sockets and connect the disk drive (see picture 4).

3 — BASIC DISK SYSTEM COMMANDS AND UTILITIES:

— *ACCESS <afsp> (optional L)
— *BACKUP Ωsource drive> <dest. drive>
— *COMPACT (optional <drive>)
— *COPY <source drive> <dest. drive> <afsp>
— *DELETE <fsp>
— *DIR (<dir>)
— *DRIVE (optional <drive>)
— *ENABLE
— *F40 (optional <drive>)
— *F80 (optional <drive>)
— *INFO <afsp>
— *LIB (optional <dir>)
— *LOAD <fsp> (optional <load address>)
— *RENAME <old name> <new name>
— *SAVE <fsp> <start> <end> <exec>
— *TITLE <title>
— *VERIFY (<optional <drive>)
— *WIPE <afsp>
— *BUILD <fsp>
— *DISC
— *DUMP <fsp>
— *LIST <fsp>
— *TYPE <fsp>
— *DDFS



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Optional extra:
— DFDC instead of DDFS: £10.00.

Other OS commands include LOAD, SAVE, BPUT, BGET, OSFILE, BLOCK GET, BLOCK PUT, OSARGS, OSFIND, PTR, OSWORD 7F, 7D, 7E etc.

Care is taken in the disk directory presentation, showing the disk size and other useful information. Whenever a diskette is being spun, its number of tracks and density are identified. This information helps the DFS to skip alternate tracks if a 40 track disk is in use in an 80 track drive and also switch the FDC to single or double density.
The net result is exceptional response and user-friendliness.
Outstanding speed too.
As shown in the benchmark test on the opposite page.

CUT THE COST OF RUNNING YOUR MACHINE

Solidisk DDFS comes with free bundled software: (see picture 5).

— Solidisk Database — a fast, efficient and flexible disk based random access database. Ideal for prescription records, club membership etc.
— Solidisk wordprocessor.
— Solicalc electronic spreadsheet.
— Stock Control — very useful for small commerce. Features include menu driven, easy to follow operating instructions, stock items can be grouped by categories, by suppliers, by frequency of movements etc. Stock valuation report (inventory), sale price list, reorder forms can be printed automatically as requested.
— Silexicon — the most successful spelling checker with English, French and German dictionary. Self dictionary generating capability.
— Macro Basic — a BASIC program generator capable of using bits of old programs to create new programs. Simply ingenious!
— Benchmark for disk drive and disk utilities.

4 — OUTSTANDING PERFORMANCE:

The table below shows the benchmark timing for STL DDFS 1.4. The benchmark consists of disk operations such as save and load a 16k program, open and close files, BPUT, BGET strings and numbers, format and verify a disk etc., and is available upon request, otherwise listed in Solidisk DDFS User Manual.
The benchmark tests B1 to B9 are the same as used by many reviewers. The time is expressed in seconds and parts of 100th of a second. The disk drives are twin 40/80 track double sided MITSUBISHI M4853, the diskettes are Verbatim Datalife MD 557 series, 96 TPI, double density, double sided, pre-verified to ensure that the media is free of all error and mechanical defects and containing solely the benchmark program. The test is loaded into memory, the drive motors are allowed to stop completely 2 seconds between tests, 10 timing samples are taken and the mean time is calculated automatically.
For example:

```
100 DEFFNb1:REM Save a 16k program.
110 T% ÷ TIME
120 *SAVE A 8000 +4000
130 ÷ TIME — T%
```

Full listings are included in the User Manual.
This FN is called 10 times with 3 sec. interval, the mean result is printed as 'B1'.

BENCHMARK DESCRIPTION	S/D TIME	D/D TIME	
B1 Save 16k	2.62	1.43	
B2 Load 16k	2.45	1.23	
B3 Openin and close 100 times	20.70	20.16	*See note 1
B4 Openout and print 1000 numbers (255)	5.84	4.66	
B5 Openin and input 1000 numbers (255)	4.72	4.14	
B6 Openout and print 100 80 bytes strings	6.18	4.91	
B7 Openin and input 100 80 bytes strings	4.90	4.31	
B8 BPUT 100 bytes (255)	3.01	2.06	
B9 BGET 1000 bytes (255)	1.88	1.52	

OPERATIONS	S/D TIME	D/D TIME
FORMAT 40 TRACKS:	17.74	17.74
FORMAT 80 TRACKS:	33.22	33.22
VERIFY 40 TRACKS:	9.30	9.30
VERIFY 80 TRACKS:	17.84	17.84
BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K-10 FILES	22.42	18.82

Note 1: Whenever a file is to be opened, STL DDFS automatically refreshes the disk directory, thus preventing erroneous disk change. Many other DFS's do not take the same care, although yielding a much shorter time, and this could accidentally stop the program.

With Wordwise:
Load 2000 words (17811 bytes) 16.80 sec. (41.40 sec. with AC.
With Scribe:
Count 2000 words (17811 bytes) 4.20 sec. (9.80 sec. with AC .90 DFS)
With Beebug's Masterfile:
Sort records 1 to 20 in PEOPLE sample database, the database is presorted on field 2 then the program is asked to sort on field 1, the time is then taken: 56.23 sec. (127.86 sec. with AC.90 DFS).
These timings are improved even further in double density mode.

The figures speak for themselves.

STL DDFS dramatically increases the operating speed of your software, including wordprocessors like Wordwise, View, Scribe, databases like Masterfile, Starbase etc.

Solidisk engineers won't stop there.

ONE ROM TO RULE THEM ALL

Already a super mini floppy (2.4 MB) and controller for under £400, a 10MB integrated Winchester hard disk for under £600 AND AN EVEN MORE POWERFUL 16K ROM (2.0 UPGRADE) with outlined specifications below are planned for Christmas.

— Unlimited number of entries into the disk directory.
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— Quadruple FDC drivers (8271, 8272, WD 1770, WD 2793).
— RAM Disk facilities for Solidisk Sideways RAM.

6 — SOLIDISK DFDC:

THE ONLY SYSTEM TO ADD DOUBLE DENSITY AND KEEP COMPATIBILITY.
If your BBC is already fitted with Acorn Single Density DFS, you can ADD double density to your system and KEEP the existing DFS with Solidisk DUAL FDC Filing System (DFDC).
Solidisk DFDC system overcomes the problems caused by around 5% of the games 'specially those produced by Acornsoft newest releases such as Elite). These programs (directly) controls the 8271 thus requiring its presence.
Solidisk DFDC ROM controls BOTH FDC at a flick of a switch, you can choose the new FDC for speed or the old 8271 for Acornsoft game disks.

7 — PRICES (including P and P and VAT)

STL DDFS (disk chip upgrade for BBC B) £39.95
STL DFDC for those who have Acorn DFS £49.95
640k DISK OUTFIT (complete package) £209.95
1.3MB DISK OUTFIT (with twin drives) £359.95
2.0 ROM Upgrade (available soon) £10.00

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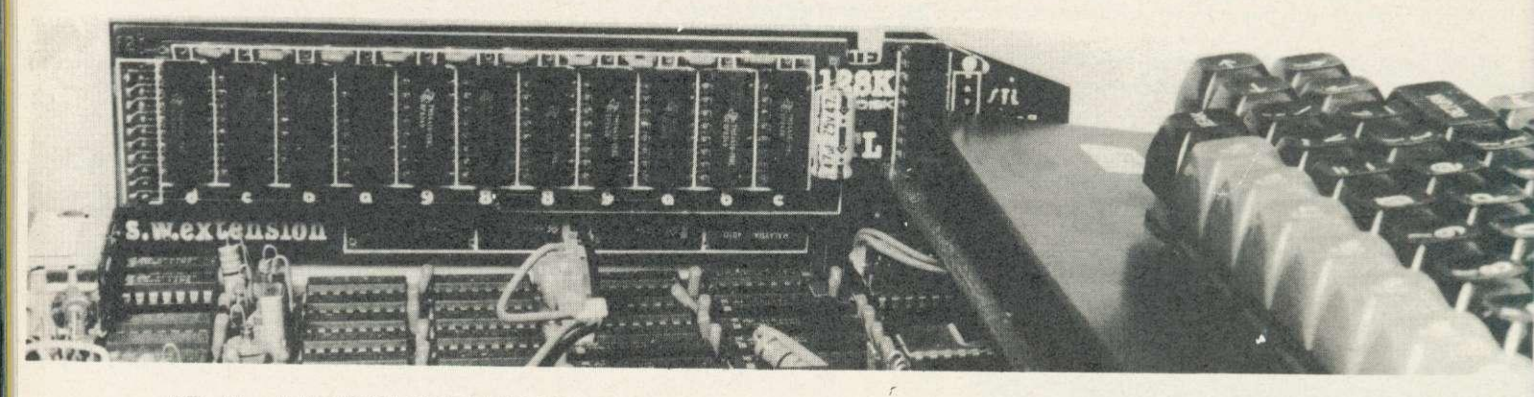
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SOLIDISK'S NEW TELEPHONE NUMBER: SOUTHEND (0702) 354674 (10 lines)

SOLIDISK SIDEWAYS RAM: 25,000 UNITS SOLD



"Exciting" (ACORN USER JAN 84), *"Power to your Beeb"* (PCN 61, MAY 84), *"Break the RAM Barrier"* (A&B)

HAS YOUR BBC COMPUTER GOT ITS SIDEWAYS RAM BOARD YET?

Not surprisingly many BBC computers have got their sideways RAM boards. Solidisk Sideways RAM can be completely integrated into the BBC computer system: with 6502 and Z80 second processors, Torch disk pack, teletext, Econet and Solidisk 8— sideways ROM expansion board.
Adding Sideways RAM to the BBC computer is simple. And it will multiply the machine's power.
Here is how.

1— HOW DOES IT WORK?
Occupying the same place as sideways ROMs (such as BASIC, DFS etc) it is treated like other sideways ROMs and therefore can replace them.
Sideways RAM can run any language, and filing system, wordprocessors, databases etc.

2 — WHAT SORT OF SOFTWARE DOES IT RUN?
Better than sideways ROM, sideways RAM can be written into. This property makes it not only possible to run the same programs as their ROM counterparts but sideways RAM can be used as Virtual Memory, RAM disc, printer buffer, Basic program store, 65-C-02 assembler, zero RAM, take DFS etc, etc . . .

3 — WHAT OTHER SERVICES DO YOU GET WITH ALL SIDEWAYS RAMS?
Solidisk sideways RAM comes with lots and lots of free software (see list on opposite page). As a sideways RAM user, you will be able to get updated disks*, free local expert advice and free bi-monthly newsletters to keep you informed. Solidisk spend more than 1,000 man hours every month to produce free software for all sideways RAM users. More and more free software will be available every month.

4 — WHO USES SIDEWAYS RAM?
Solidisk sideways RAM is widely used in schools for ECONET, by programmers to develop new software, in small business systems for wordprocessing and database** and now at home, even for games. New applications are being found every day, such as moving screen memory to Sideways RAM (essential for increasing memory for VIEW and VIEWSHEET), Colour Imaging System, Teletext page logger and generator, computer typesetting etc.
Sideways RAM is such a versatile and flexible instrument that it will renew your interest continually.

5 — WHICH SIDEWAYS RAM DO YOU NEED?
Solidisk sideways RAM is available in multiples of 16k, each replacing a sideways ROM. Units are in 16k, 32k, 128k and 256k.
The first step is to evaluate your needs.
Then consult the chart opposite.
You can buy a small unit to start with, and exchange it later for a larger one. Extra costs involved with upgrading are minimal. The SWR16, 16k sideways RAM is adequate for most simple tasks (running common programs or for Econet slave stations), including fast disk copying with a single disk drive.

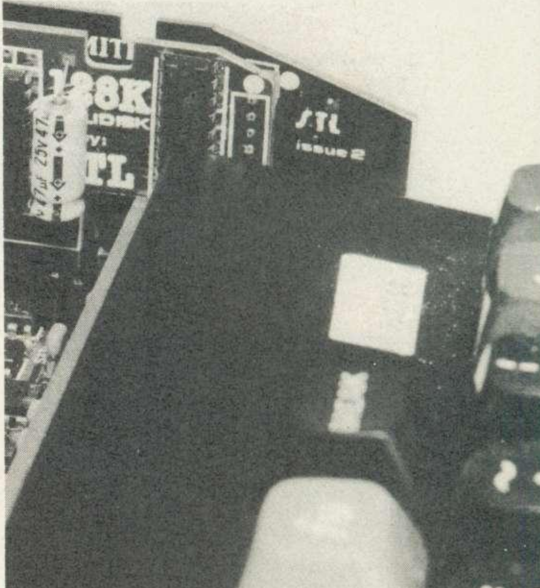
For wordprocessor: using VIEW or WORDWISE, a SWR32 will do. Large documents (20 page plus) will require something like SCRIBE and the 128k or 256k Solidisk**.

For database, unless very high speed is required, a SWR32 will suffice for most popular databases such as Beebase, Fileplus, Starbase, Datagem. Otherwise use the 128k or 256k Solidisk**.

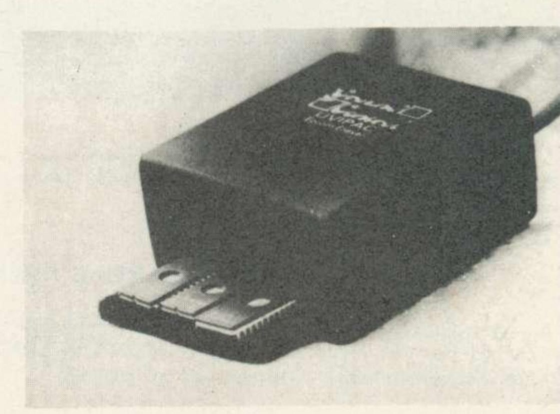
Remember — the more memory you instal inside the BBC computer, the more power you will get out of the machine.

All sideways RAM units come complete with 60+ page Sideways RAM User Manual, 1 utility diskette and 1 year warranty.

****Solidisk recommends SCRIBE and STARBASE because they exploit perfectly the inherent speed of RAM disc.** Quite often, some users try to solve a software problem (such as increasing the size of Wordwise) by a hardware solution (buying the 128k Solidisk). The better way is to buy Merlin's Scribe (or wait until we offer you one similar for free) and then increase its speed with the Solidisk. The situation regarding databases is much simpler as Solidisk works well with most of them (from 6 times speed increase with Beebug's Masterfile to 2 times with Starbase).



UVIPAC EPROM ERASER



TEAC DISC DRIVES FD55 Series



6 — SENDING FOR FREE SOFTWARE:

Our free software is divided into volumes and is available in single density, either 40 or 80 track 5.25″ diskettes. 40 track diskettes contain only 1 volume, 80 track diskettes contain 2 consecutive volumes, (1+2, 3+4, 5+6, etc.)
All sideways RAM is supplied with 1 diskette, containing either VOL. 1 (40 tracks) or VOL. 1+2 (80 tracks) as requested. Extra volumes are charged foe media and postage cost.

The following volumes are available at the present time:
- **VOL. 1:** General Utilities: Menu, STLDISC, STLOEOO, STLRFS, Printer Buffer, STLRFS, Quickly, Fastbackup, Keyboard, Word64, help!.
- **VOL. 2:** English Spelling Checker: Suilexicon and English dictionary (15000 words).
- **VOL. 3:** BASIC program generator: Macro Basic. Never Bad Mode again: Virtual Memory.
- **VOL. 4:** Database: Solidisk Datafile.
- **VOL. 5:** Foreign Language Dictionary Generator: Silexigen, Silexicon source code for programmers.
- **VOL. 6:** French spelling checker (15,000 words).
- **VOL. 7:** German spelling checker (13,000 words).
- **VOL. 8:** Machine code tools: Solimon, the finest machine code monitor with Disassembler, debugger, single step etc. for both 6502 and 65-C-02 (for second processor 65 C 02 assembler (for second processor), UVIPROM control software, SPRITES and SPRITE generator (providing 60 sprites per 16k sideways RAM).
- **VOL. 9:** to be released in October: Solidisk Toolkit, Rubber band, and Z80 drive C (RAM disc facilities for Acorn Z80 second processor).
- **VOL. 10 to 19:** Source code for use with the Technical Manual.

7 — TECHNICAL MANUAL:
THE TECHNICAL MANUAL contains estensive program listings and notes by their authors. It also covers the MACRO language programming (part of Macro Basic), MOS conventions for sideways software. Solidisk conventions for sideways RAM software, STL DFS entry points, the 65C02 programming facilities and schematic diagram.
The Technical Manual package consists of the Technical Manual and 3— 80 track diskettes containing VOL. 10 to 15 and costs £10.00.

8— LOCAL EXPERT HELP:
A list of Solidisk experts is printed in the Sideways RAM User Manual. For the cost of a local call, they can certainly help you with installation of software advice.
Potential experts are warmly invited to contact us.

UVIPROM EPROM PROGRAMMER AND UVIPAC EPROM ERASER

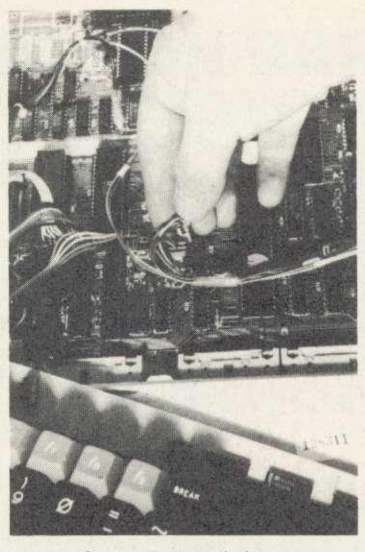
The UVIPROM EProm programmer, which plugs into the user port, allows the user to program 2764 and 27128 EPROMs, either from disc or master ROM. The unit is self-contained, complete with built-in Vpp generator and system software. Commands available are:—
*TEST — blank test for new (or erased) EPROMs.
*BLOW<aspf> — programs EPROMs from disc.
*COMP<aspf> — compares programmed EPROMs with source on disc.
*VIEW — displays hex and ASCII dump.
*READ<aspf> — reads contents of EPROM to disc.

UVIPAC-EPROM ERASER:
Mains powered EPROM eraser, can erase up to 3 EPROMS of any size in only 15 minutes. Housed in a custom moulded plastic case, with optical fibre indicator.

SOLIDISK ANNOUNCE THE MOST EXCLUSIVE SUPPORT FOR THE 65-C-02!

Have you heard about the 65-C-02?
This is the CPU that Acorn has retained for their second processor. The 65C02 has an extended instruction set, with 43 brand new OPCODEs for you to play with. Things as PHY, PLY, STA (&A6), STZ, BRA, TRB etc can save 20ι of memory and increase speed by 20-25%.
SOLIDISK GIVE YOU FREE* SPECIALLY DEVELOPED SOFTWARE FOR THE 65C02!
(*except media)
65C02 PATCH:
Using DEFFN such as DEFFN ("PLY"), extra instructions are added to the present BASIC assembler.
65C02 BASIC2 OVERLAY:
Providing you have a sideways RAM unit, this program will turn your BASIC2 instantly into 65C02 assembler. You do not have to type in 'OPT FN("PLY")' but simply 'PLY' instead, making the conversion job a piece of cake.
SOLIMON, THE ONLY 65C02 MACHINE CODE MONITOR:
This program can be softloaded into Sideways RAM or obtainable in ROM form. It has everything the popular EXMON has such as Disassembler, Find bytes/string, set ROM socket, spool, move, hard copy etc and also some 'impossible' features such as defining zero page location that will be used, single stepping sideways RAM, screen modes. More importantly, it works with the 65C02 and can even disassemble the second processor ROM!
IN VIEW OF THE LARGE DEMAND FOR THIS CHIP, SOLIDISK OFFERS IT AT ONLY £11.00+£1.00 FOR POST AND PACKING
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(It is understood that enquiries about the 65C02 CPU should be sent directly to us rather than to RCS, the Rockwell distributor.)



Connect the control wires

PRICE LISTS AND ORDERING (including P&P and VAT)

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SWR16	£43.65
SWR32	£59.95
128K SOLIDISK	£150.95
256K SOLIDISK	£257.95
The following are upgrade prices for existing Sideways Ram Users:	
16 — 32 (return complete item)	£19.00
16 — SOLIDISK (return item)	£110.00
16 — SOLIDISK 256 (return item)	POA
32 — SOLIDISK	£95.00
32 — SOLIDISK 256 (return item)	POA
128 — 256 (return item)	£125.00
DFS AND DISK DRIVES:	
STL DDFS DISK UPGRADE	£39.95
DFDC Twin FDC version	£49.95
MITSUBISHI 2×80 (incl leads+manual)	£163.00
MITSUBISHI TWIN (incl leads+manual)	£323.00
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MITSUBISHI TWIN 1.3 MB	£353.00
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DS/DD 40	£23.00
SS/DD 80	£24.00
DS/DD 80	£29.00
EPROM PROGRAMMER (use with Swr or Solidisk)	£20.95
UVIPAC EPROM ERASER	£20.95
2764 PACK OF 5	£36.00
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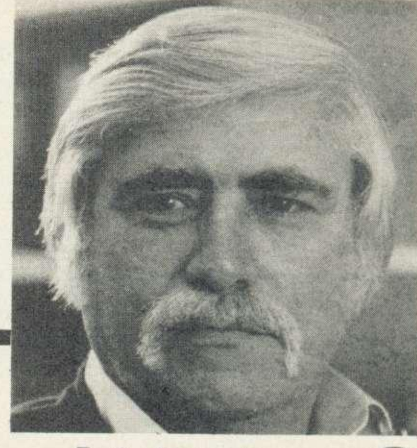
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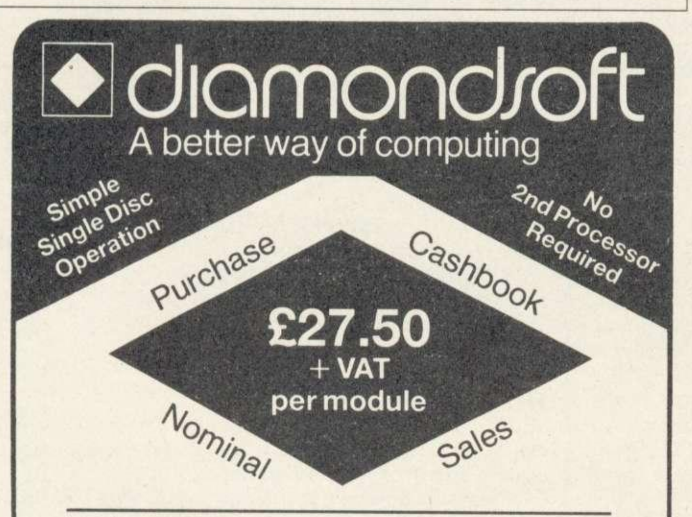


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When you call please don't disturb Harold — he broke 1000 on Snapper last week and hopes to crack 2000 soon. Mind you, there are other machines in the store that you can use to try out the software from our extensive range. Printers, disc drives and monitors too.

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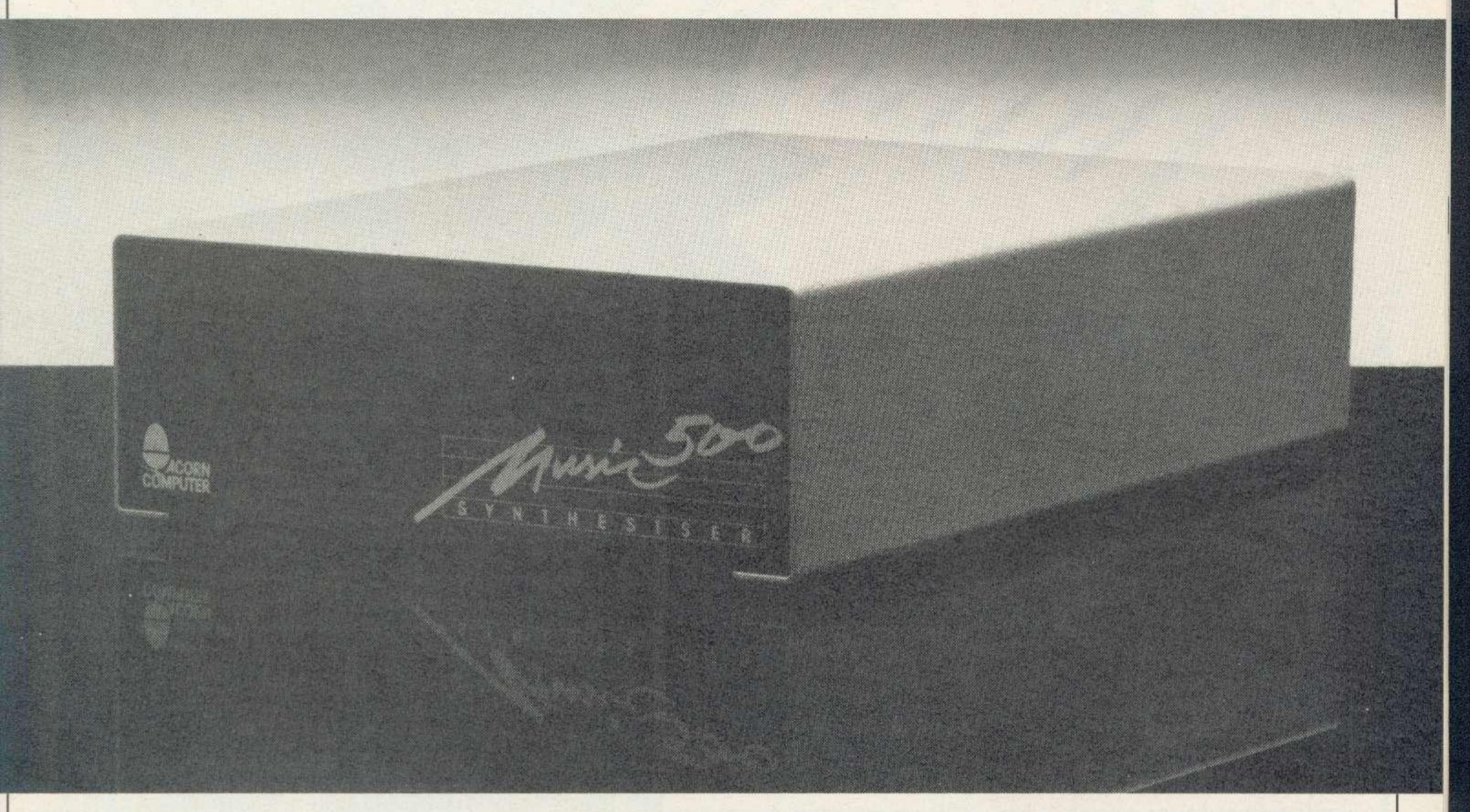
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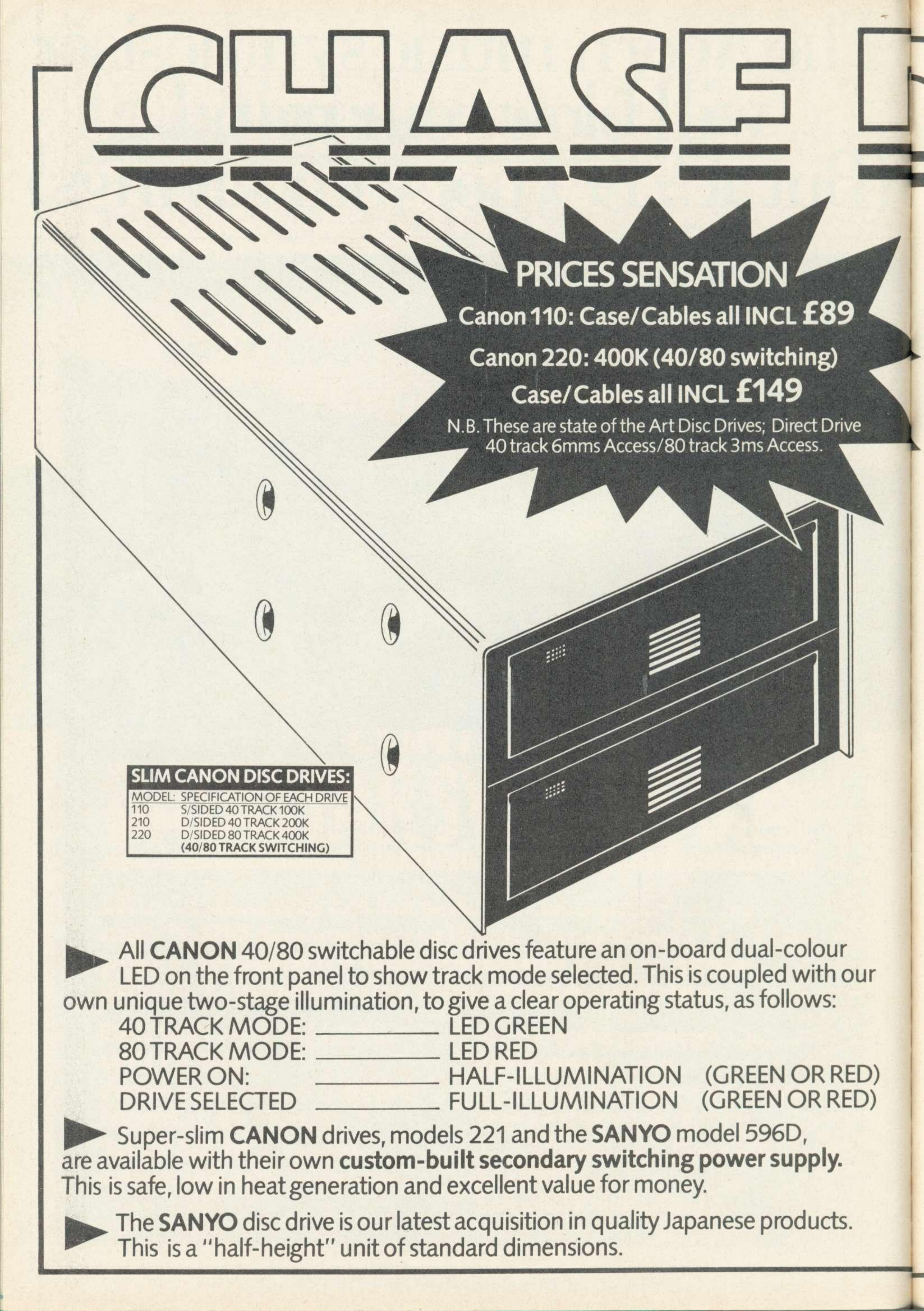
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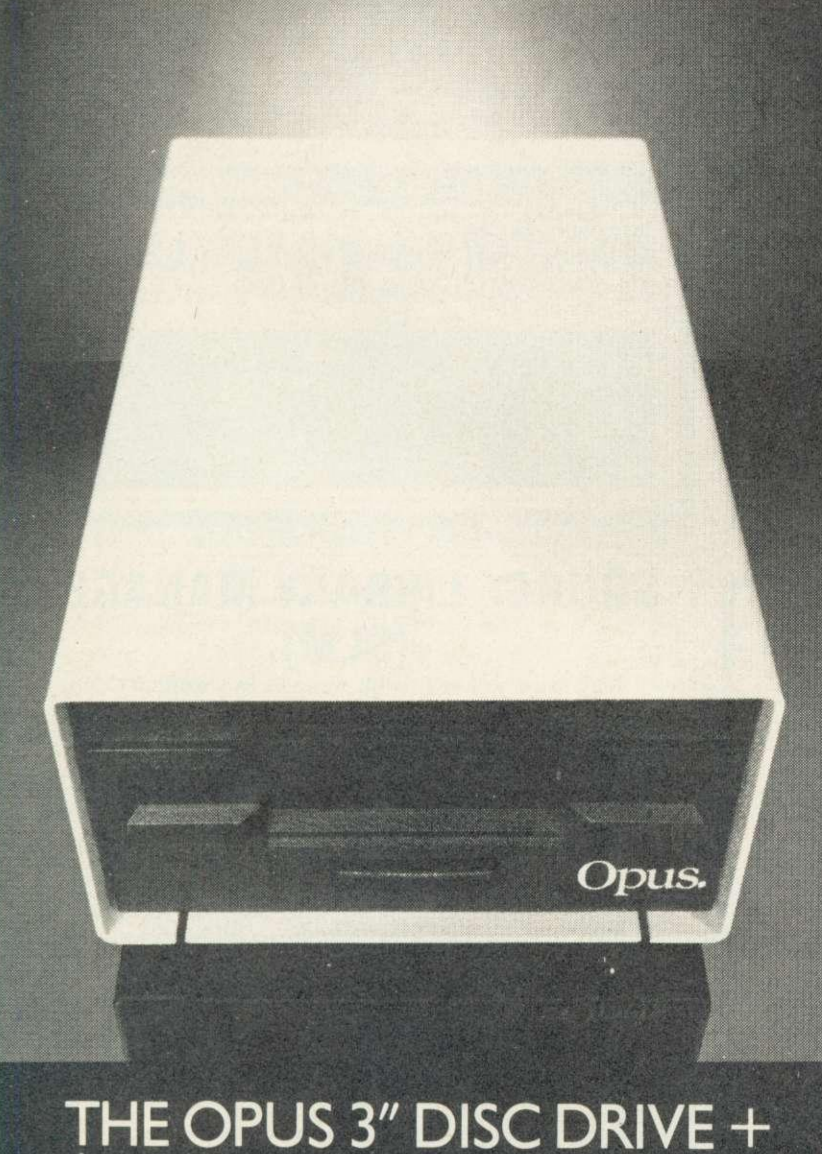
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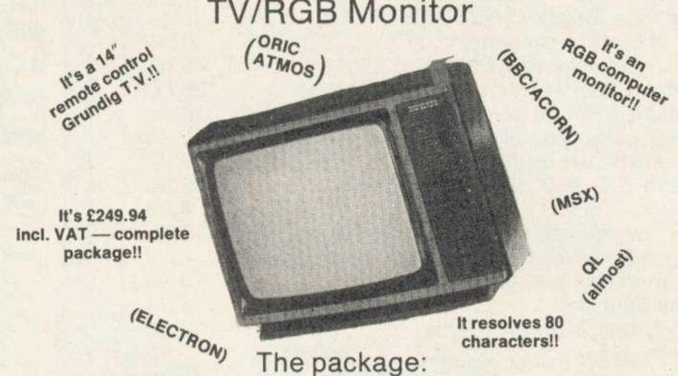
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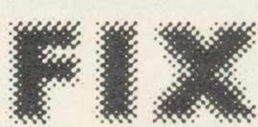
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ATOM Sell VDU card (unused), 64k RAM board expandable 128k (cost £100) 2 wire connection. Instructions, software. Also Wordpack ROM and manual, offers. Tel: Ron, Penketh 3652.

ACORN Electron: 3 months old, hardly used, under guarantee, plus tape recorder, leads, some software and books, all for £145. Tel: Halstead, Essex (0787) 473930 (evenings).

WANTED Atom games and education software for expanded Atom. Tel: Taffs Well (0222) 811047.

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BBC model B with Watford DFS, disc interface, £380. Viglen Teac 40 track, 200k disc drive with thirteen discs of free software and thirteen unused, all leads, utilities, manuals, £170. Tel: Martin (0280) 816475.

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■ **Dictionary:** check your spellings with this menu driven program for View or Wordwise (please state). Single/dual discs, expandable from 10000 words supplied. £10. Polarsoft, 9 Grayshot Drive, Blackwater, Surrey GU17 0EW.

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■ **Adventure** game for BBC 32k, 'The Lost Crown', £5.95. New programs still required, good rates paid. Cottage Software, 3 Conrad Drive, Worcester Park, Surrey. 01-330-1554.

■ **Olivetti** DY311 daisywheel printers, 32 cps, RS232 £250. Diablo, 30 cps KSR daisywheel printers, RS232 £280. 12 months old. Commonside Hardware, Wimbledon. 01-879 3768.

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■ **BBC B,** Torch disc drives cost over £1300. Hi-res monitor £220, Star 510 printer £220, Micronet modem £45. Speech, Wordwise, Graphics screendump ROMs. (Weybridge) 0932-53680.

■ **Olivetti** JP101 spark jet parallel printer for sale. Brand new from Acorn, for BBC B, complete, £170 ono. Phone Ruislip 73671 evenings or weekends.

■ **Time tabling:** T-squared, 40/80 disc-based formatting and analysis. Friendly, sophisticated, avoids errors. £25. Yorke House Software, 33 West Street, Oundle, Peterborough PE8 4EJ. Telephone 0832 72362.

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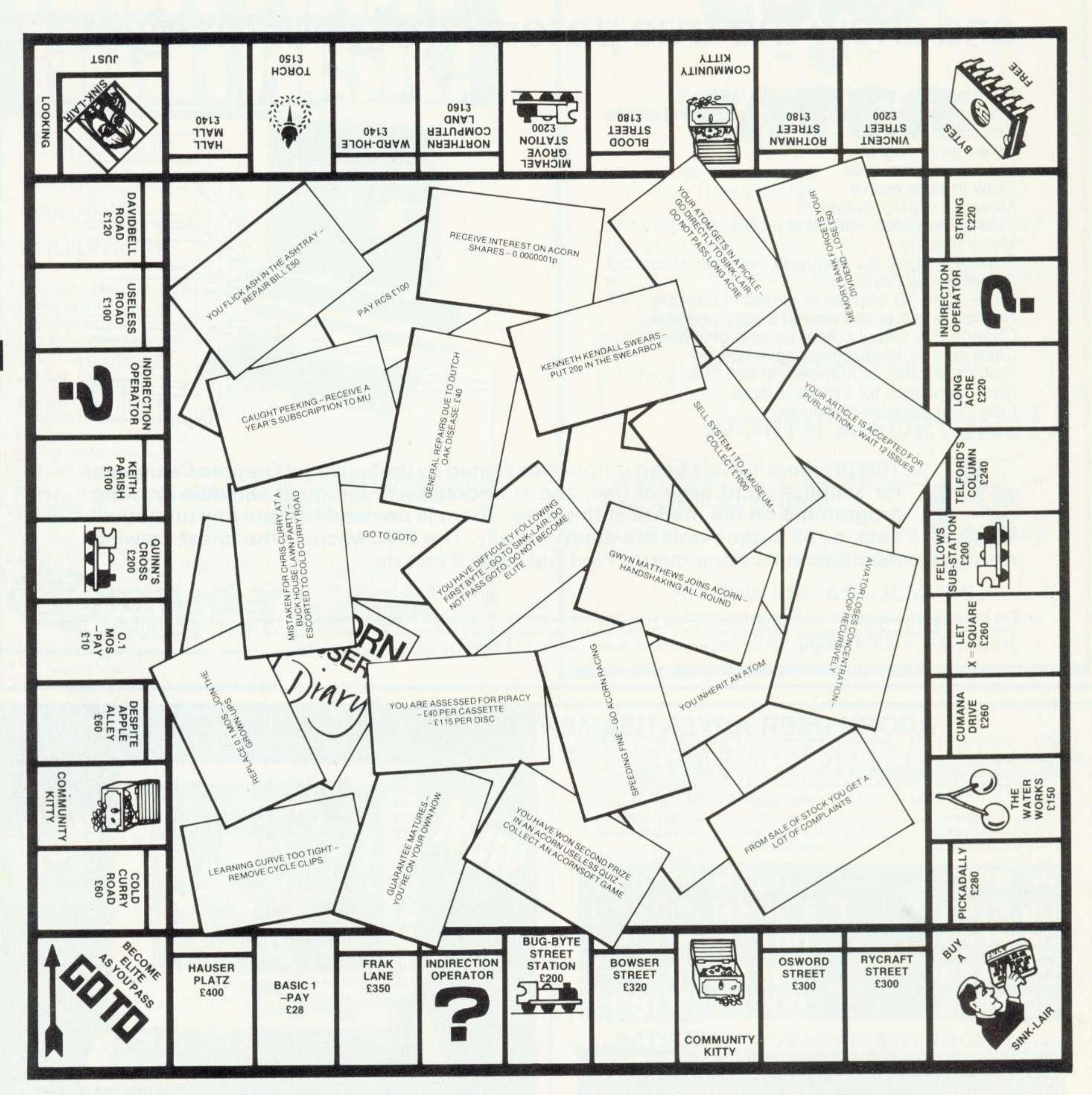
■ **Pools** BBC 32k. Enter the pools with this successful program, £7.50 complete with manual and up-to-date database. E. Crosby, 96 Gloucester Street, Cirencester, Glos GL7 2DR.

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ACORN USER ADVERTISEMENT PAGES – DECEMBER ISSUE



ACORNOPOLY: the inside story

THE inside story from the Fens this month is that Acorn has beaten glass tycoon Robert Maxwell to it and bought out games manufacturer Tron Oddingtons in a surprise move. Industry experts had thought Acorn to be taking on the board games market with internal developments code-named ABC – the Acorn Board Craze.

Hermann 'I want the racing car' Hauser commented: 'Our policy has always been to use tried and tested technology – not to announce a product before it's ready. With Tron Oddingtons we are acquiring man-centuries of R&D experience and that puts us in a position to release Acornopoly knowing it's a winner.'

Chris 'If there isn't a pig I'll have the dog' Curry said: 'This is our answer to the Japanese Fifth Generation (MSX). We intend to nip this ZX80 thing in the bud and we had Acornopoly written *by* people who use clichés *for* people who use clichés. Acornsoft is Go-ing to beat them at their own game.'

Bertie 'Battleship' Blood of Acorn's PR company Quentin Bell added: 'We're splashing Acornopoly under the slogan "Board? You will be!"'

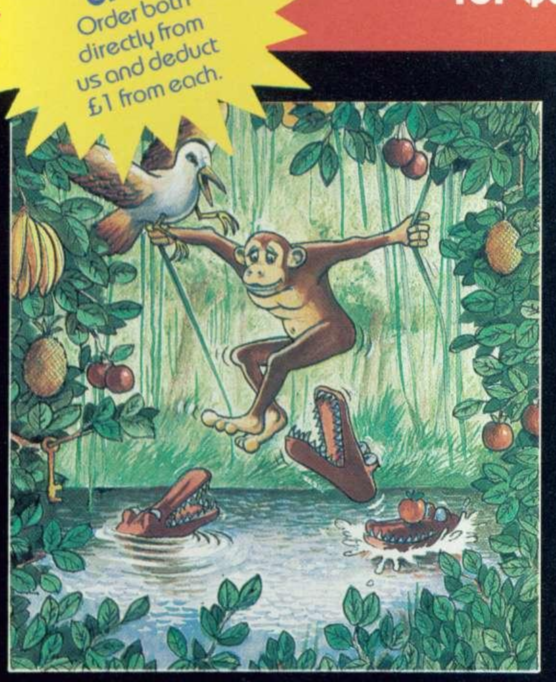
So what's it all about? We sent Orson Fact to Gamebridge to sniff out the details. Disguised as a security guard dog, he penetrated the boardroom and collared some back-of-an-envelope sketches of the prototype board.

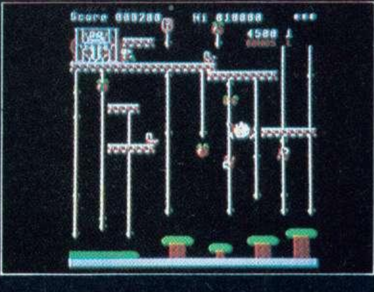
As you see from our impression of what the board will look like, you, the player, are a 1970s computer tycoon-in-the-making. You work your way to fame and fortune by a combination of buying up other computer companies (it's all the rage), courage, macho and cool precision. The game can finish in two ways: one player bankrupting all the others or when a shortage of £1 notes forces a stalemate.

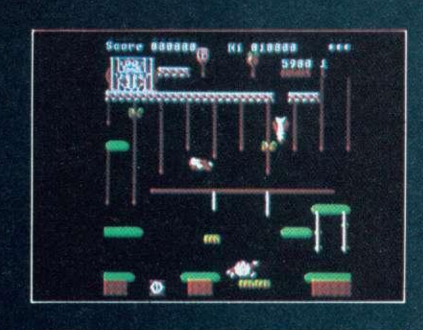
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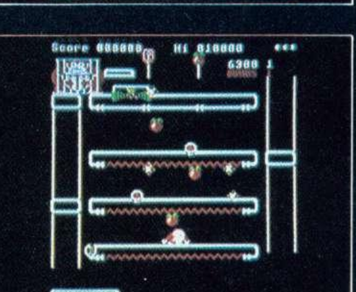


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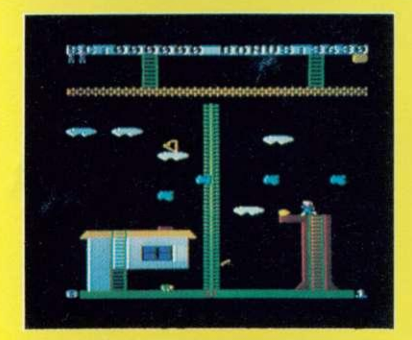
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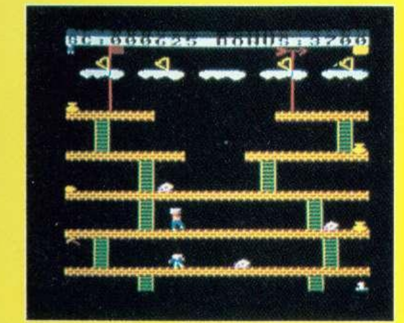
The evil Morris has kidnapped Zany Kong. Your objective is to collect the keys to release Zany Kong from the steel cage in which Morris has him imprisoned. There are four action-packed screens: The Jungle, The Spring House, The Generator Room, and Morris' hideout. Climb the vines, chains and laser beams avoiding the Snappers and the vicious Ardvark Birds, but don't delay – there's no time to spare. A brilliant arcade-style game which we believe is our best release ever! But why not judge for yourselves?
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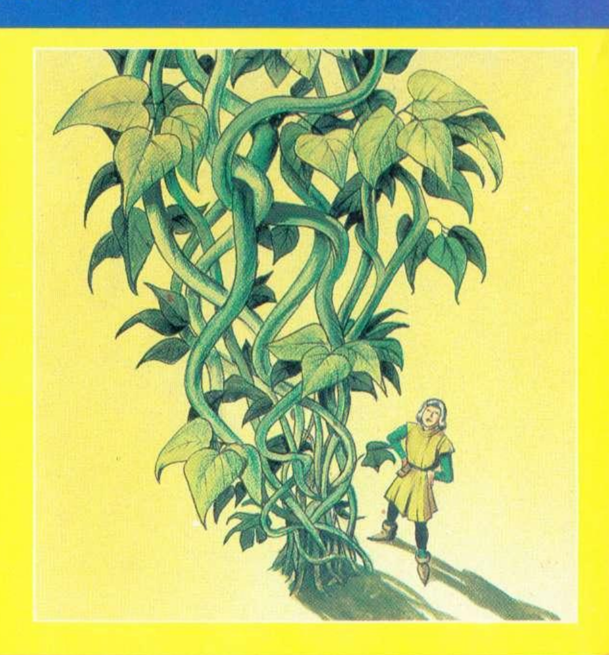
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Author: Andrew Harley.
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